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THE CONDOR

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JANUARY-FEBRUARY, 1949

NUMBER 1

LIFE HISTORY OF THE RUDDY QUAIL-DOVE

By ALEXANDER F. SKUTCH

A glance at the Ruddy Quail-Dove (*Oreopeleia montana*), amid the dark undergrowth of the forest where it dwells, reveals it to be a pigeon of marked personality. Its fairly long and slender bill does not extend nearly straight forward, as in most members of the family, but is tilted strongly downward, forming an angle of almost forty-five degrees with the rather flat crown, thus giving the stout bird a most peculiar aspect. In coloration, too, this dove is noteworthy. The upper plumage of the male is chestnut or rufous-chestnut, fading to cinnamon-rufous on the forehead, and glossed with metallic reddish-purple (very rich in direct sunlight) on the hind neck and back. A broad stripe of light pinkish-cinnamon extends from the chin below the cheeks to the ear coverts. Beneath this a band of the reddish-brown of the upper parts projects from the sides of the neck toward the throat. The foreneck and chest are vinaceous fawn-color, which fades to warm buff on the posterior under parts. The anterior margin of the folded wing is whitish, forming a narrow but conspicuous vertical bar on each side of the dove. The female is a far duller bird with her light or dark olive-brown upper plumage that changes to dull cinnamon-buff on her forehead and superciliary region. The light stripe from the base of her bill to her ear coverts is of the same color as the forehead. Beneath this there is a darker band of cinnamon-brown. Her foreneck and chest are dull cinnamon or brown, her abdomen and under tail coverts buff. In both sexes the bill is dark horn-color at the tip, at the base becoming red, which is also the color of the bare skin on the lores and surrounding the eyes, and of the legs and the feet. On the male the red of these featherless parts is deep and sometimes of a purplish cast, on the female it is paler. The eyes of both sexes are yellow, brownish-yellow or reddish-brown.

The Ruddy Quail-Dove inhabits the Greater Antilles and almost the whole extent of continental tropical America from the state of Veracruz in México to Bolivia and Paraguay. It is a lowland species which extends upward, in widely separated parts of its vast range, to 3000 or rarely 4000 feet above sea-level. In southern Costa Rica I have seen it occasionally at 3000 feet, but it becomes more abundant as one descends from this altitude; it has been recorded at 3500 feet in México and on Mt. Roraima in British Guiana, and at 4000 feet on the Volcán de Chiriquí in western Panamá (Ridgway, 1916:481-483). Everywhere it dwells in the heavy forest or at times beneath the taller second-growth, where alone or in company with a mate it walks over the ground in the deep shade, bobbing its head in typical pigeon fashion. Sometimes while I have followed a narrow path through the woodland one of these doves has walked rapidly ahead of me for a considerable distance, then at last veered aside to vanish amidst the undergrowth. Although as a rule they prefer to walk off when disturbed, if surprised they may fly up to some low perch, rarely more than four or five feet above the ground, where they pause to survey their surroundings, then dart off into the undergrowth again.

They are shy and rarely allow the bird-watcher more than transitory glimpses of themselves.

FOOD

The Ruddy Quail-Dove picks most if not all of its food from the ground. Gosse (1947:321-323) mentions that in Jamaica it eats the fallen berries of the pimento, the physic-nut and other oily seeds, berries of the sweet-wood, and small slugs, and that in captivity it thrives upon maize.

VOICE

The call of the Quail-Dove is a soft deep *coo*, usually delivered while the bird rests upon the ground—a mournful sound often heard amidst the forests of the Valley of El General from March to June. Gosse states that in Jamaica this dove utters its “sad moan” in March and April, usually from the ground, but at times while perching in a tree.

THE NEST

In the basin of El General in southern Costa Rica, where the following observations were made, the Ruddy Quail-Dove begins to nest in April, after the forest has been soaked and refreshed by the returning rains. The breeding season is at its height in May and June, but late nests are occupied in July and even early August. Beebe, *et al.* (1917:213-214) state that in British Guiana the main nesting season was during April and May, although possibly it started earlier. Gosse found a nest in Jamaica in June, and Carriker (1910:405) found one containing a nestling at El Pozo in Costa Rica late in the same month.

The slight, frail nest is placed amid the undergrowth of the primary forest, or of tall second-growth woodland, at no great height. Beebe gives the height of those he found in British Guiana as from one to five feet. Six that I have seen in Costa Rica ranged from $2\frac{1}{2}$ to 7 feet; while three discovered by Belcher and Smooker (1936:7) in Trinidad were at about eight feet. Almost anything that will hold a broad, flat nest with slight internal cohesion is used by the doves as their site. Of those that I have seen in Costa Rica, two were on the flat tops of old decaying stumps overgrown with ferns, aroids and other epiphytic growths whose foliage screened them; two were on the gathered terminal pinnae of great fallen fronds of the chonta palm (*Iriartea*) which had lodged in a more or less horizontal position among the bushes and vines about two yards above the ground; two were on fallen dead branches held in a leaning or upright position by the surrounding bushes. One of the last rested upon the bases of the long, stiff leaves of an epiphytic aroid growing attached to the fallen bough, which had lodged upright beside a low, spiny palm. Beebe's nests in British Guiana were on “the head of an old rotted stump or the fork of a low outhanging branch, or possibly the horizontal surface of an old gnarled liana that ran close to the ground.” Those of Belcher and Smooker in Trinidad were “placed near the far end of a horizontal branch.”

The Quail-Dove's nest is a slightly concave platform or mat of coarse dead twigs, covered with small leaves which may be either green or brown, but are apparently brought while at least partially green and later wither in the nest. If supported on a stump or other firm base, the scant nest may consist of barely enough sticks and leaves to keep the eggs from touching wood or rolling off.

THE EGGS

At a late second-brood nest (6b) I learned some of the details of the laying of the two eggs. The second nestling of nest 6a had left on June 17, 1947. On July 19, the old nest had been covered with a few freshly gathered leaves, some green and others dead. At 7:30 a.m. the nest contained a single egg, cold and unattended. Although

most pigeons, so far as I have observed, keep their nest almost constantly covered in the interval between laying the first and second eggs, this was not true of this pair of Quail-Doves. During the remainder of July 19, I made three visits to the nest and three more on the morning of the following day, always finding the single egg uncovered, cold and, early in the morning, also wet, indicating that it had not been incubated during the night. As I approached the nest at 12:20 p.m. on July 20, the female rose from the ground close by, and the egg, although uncovered when I came within sight, was warm. Returning at 3:15, I found the female covering two eggs, the second having been laid during the early half of the afternoon. At an earlier nest I had found the first egg uncovered and cold at midday.

The time of laying by pigeons is a most interesting subject on which it is desirable to have more information. Whitman (1919:45, quoted by Nice, 1922) found that captive Mourning Doves (*Zenaidura macroura*) laid the first egg of a set between 4 and 6 in the evening, while the second egg was laid early in the morning of the second day following, between 6:30 and 9:00. The Ring Dove (*Streptopelia decaocto*), according to Schooley and Riddle (1944), laid the first egg of a set late in the afternoon, at about 5 o'clock, the second on the morning of the second day thereafter, at about 8:45. As the period of daylight lengthened from winter to summer, the hour of depositing the first egg became correspondingly later in the afternoon. Likewise there was a tendency for the second egg to be laid earlier in the morning. On cloudy days the first egg was deposited about 30 minutes earlier in the afternoon and the second egg about 45 minutes later in the morning. A White-fronted Dove (*Leptotila verreauxi*), whose nest already contained one egg when I found it, laid her second between 8:00 and 10:30 the following morning. A Red-winged Talpacoti Dove (*Columbigallina talpacoti*) deposited her second egg between 6 and 9 in the morning; and a Blue Ground Dove (*Claravis pretiosa*) laid the second egg between 7:00 and 10:00 a.m. But Anderson and Anderson (1948:153) record that an Inca Dove (*Scardafella inca*) laid her second egg in the afternoon, two days after they found the first. Thus, the Inca Dove and the Ruddy Quail-Dove differed from the other species mentioned here in laying the second egg after midday.

The Ruddy Quail-Dove regularly lays two eggs in a set. Although nearly all pigeons' eggs are pure white, these are pale buffy, cream-buff, or (Beebe, 1917:213) dark cream-color. Ten eggs measured at the nest in Costa Rica averaged 27.6 by 20.2 millimeters. Those showing the four extremes measured 29.4 by 19.4, 28.6 by 21.4 and 26.2 by 19.8 millimeters. Beebe gives the average measurements of eggs from British Guiana as 26.5 by 19.5 millimeters.

The distribution according to month of laying of the seven nests found in the basin of El General, Costa Rica, at 2000 to 2500 feet above sea-level, was as follows: April, 1; May, 3; June, 2; July, 1.

INCUBATION

The pattern of incubation of the Ruddy Quail-Dove is much the same as with other pigeons. The male sits through most of the day. The female replaces him in the afternoon, passes the night on the nest, and remains there until the male returns next morning. The second-brood nest (6b), where the second egg was laid early in the afternoon of July 20, was near my house and I gave much attention to it during the period of incubation, making numerous visits at all hours of the day to see which member of the pair was covering the eggs, and watching six exchanges of duty from the blind. Other nests less conveniently situated were studied less carefully, but I saw at them nothing to suggest that the doves' manner of incubation differed materially from that at the late nest.

On July 21, the day after the second egg was deposited, the male of nest 6b at 7:20 a.m. was already sitting on the slight nest on top of the low, decaying stump. But after incubation was well advanced he arrived considerably later. On July 26, when I watched from a blind, he came at 8:08, on July 27 at 8:02, on July 28 at 8:06. Then, as the eggs neared the point of hatching, he came earlier again. At 7:51 on July 29 he was already sitting; on July 30 he was present at 6:35; and on July 31, the last day of incubation, when I again watched from the blind, he came at 6:54. On June 7, the last day of incubation of the previous brood at this nest, I had found him present at 6:40 a.m.

On July 20, at 3:15 p.m., the female dove was covering two eggs in nest 6b, the second of which she had laid within the preceding three hours. On July 26, watching from the blind, I saw her arrive at 4:13, and on July 27 at 4:58. Through most of the incubation period she came between 3:30 and 5:00 in the afternoon. But when the eggs were about to hatch she came earlier again, just as the male did; on July 31 she was already on the nest at 2:40. Thus, both parents, before the eggs actually hatched, began to change to a schedule of early arrival, which would be their schedule after the nestlings were hatched.

In the middle of the incubation period the male's daily session on the eggs lasted between eight and nine hours. On July 26 he was on the nest for 8 hours and 3 minutes; on July 27 for 8 hours and 55 minutes. Although my watches of the nest were not continuous, his habitual presence when I came, and analogy with other pigeon nests that I have watched throughout the day while incubation was in progress, lead me to believe that if undisturbed the male Quail-Dove did not interrupt his single long daily session.

Each member of the pair normally continued on the eggs until it saw the mate approaching over the ground. Often it saw the other before I, watching from the blind, became aware of its arrival. Then it would slowly rise from the nest, step to the edge of the stump and fly away, going swiftly in an almost horizontal course, low over the ground, until lost to view among the trees. The new arrival would continue to approach, walking slowly over the ground until two or three yards from the base of the stump. Here it would pause briefly, then fly up to the nest and settle on the eggs. The observed intervals between the departure of the female in the morning and the actual arrival of the male on the nest were two minutes, eight minutes and less than one minute. The observed intervals between the flight of the male in the afternoon and the actual beginning of incubation by the female were two minutes and one minute. The exchange of duty at the nest was always effected in perfect silence.

Usually the dove arriving to take its turn at incubation brought something for the nest—a green or dying leaf, more rarely a petiole or twiglet. Of the four times that I watched the male come to replace the female, he brought something for the nest three times. Once when I chased him from the nest and then entered the blind, he picked up a leaf as he walked back and laid it on the nest. The female brought a leaf both of the times that I watched her come to replace the male. When driven from the nest by me soon after he had begun to incubate in the morning, the male once returned after 33 minutes; but another time he stayed away more than 75 minutes.

I have not seen pigeons of other species bring contributions to the nest when they came to take their turns at incubation. But I have watched females of both the Red-winged Talpacoti Dove and the Blue Ground Dove carry straws or the like to the nest in fairly rapid succession while their mates covered the already well incubated eggs, between nine and ten o'clock in the morning. This activity of the females in building up the occupied nest was most unexpected, because with both of these species, and

apparently in the pigeon family in general, the material for the original construction is brought chiefly if not wholly by the male, who alights upon his mate's back and deposits his burden beside her, while she sits quietly on the nest-site and arranges what he has brought.

One afternoon while I sat in the blind awaiting the female Quail-Dove's return to the nest, I saw a dove in the distance, walking toward the stump from the direction whence the female usually approached. I wondered why the male dove, who usually saw his partner and flew from the nest before I caught a glimpse of her, continued to sit motionless this time. The approaching dove walked deliberately past the nest and vanished amid the undergrowth to my right. When it came closer, I saw that it was not a Ruddy Quail-Dove at all, but a Cassin Dove (*Leptotila cassini*). Although I had been at first deceived by a general similarity of appearance between the two species as seen at a distance in the dimly lighted undergrowth of the woods, the male Quail-Dove had not. Forty minutes later his mate arrived and he flew away.

The Quail-Doves in general sit steadfastly and allow a man to come close before they fly from their eggs or nestlings. The present pair would from the first permit me to come very near, and before their eggs hatched they would remain covering them while I slowly advanced to within a yard of the male, and within four feet of the female. When they saw me coming, they would crouch forward on the nest, lowering the breast and head, elevating the tail, and at the same time compressing all the feathers of the body and making themselves appear far more slender than usual. In this posture they would remain motionless until I came so close that they fled. Then they would fly more or less sharply down to the ground and walk away. At times, especially as the eggs neared the point of hatching, they would display in a spectacular fashion after reaching the ground, but they were not consistent in this. The male dove was more assiduous than the female in trying to distract my attention from the nest. On the morning of July 30 he allowed me to come within a yard before he flew from the eggs on a downward course, to reach the ground about fifty feet away. Then he walked deliberately off with his wings spread and flapping loosely as though not entirely under his control. He continued this until he passed from view amid the undergrowth, a hundred feet or more from the nest. But at noon the following day, when the eggs were pipped, he flew off at least fifty feet and disappeared without displaying. That evening at five o'clock, when the eggs were nearly ready to hatch, the female dove continued to cover them until I approached within four feet, then flew off without "feigning injury."

At this nest the second egg was laid between 12:20 and 3:15 p.m. on July 20, and both eggs hatched between 5:20 p.m. on July 31 and 5:40 next morning. Hence the incubation period was not less than 11 days and 2 hours nor more than 11 days and 18 hours; or we may write it as 11 days 10 hours \pm 8 hours. At an earlier nest the second egg was laid between noon on May 22, 1942, and 4:30 p.m. next day, and both had hatched by 5 p.m. on June 2. On the assumption that the second egg was laid in the morning (of May 23), I reported in an earlier paper (Skutch, 1945:15), that the incubation period was 10 days. It would have been more correct to have stated it as 10 or 11 days. Even the second is amazingly short for so large an egg. We may compare it with the period of 12 or 13 days for the smaller Red-winged Talpacoti Dove; 13 days for the Inca Dove (Anderson and Anderson, 1948:153-154); $14\frac{1}{8}$ to $14\frac{7}{8}$ days for captive Mourning Doves (Whitman, 1919:465, *vide* Nice, 1922); 13 or 14 days for captive Turtle Doves (*Streptopelia turtur*) and 16 to 19 days for various species of *Columba* in the British Isles (Witherby, *et al.*, 1940:129-146).

THE NESTLINGS

Newly hatched.—At nest 6b, both eggs were well fractured at 5:20 p.m. on July

31. The following morning I entered the blind at 5:40, while the light was still dim in the woodland. The female dove was sitting and remained quietly until the male approached at 6:33, twenty minutes earlier than he had come the preceding day. After she flew off I saw the heads of the two nestlings, which had hatched during the night. The male dove, who had brought a petiole, promptly flew up to the nest, placed it beside the nestlings, and settled down to brood them. He remained almost motionless until 9:10, when I left the blind and advanced to the nest for a closer view of its new occupants. After I had come within a yard the male flew down, landing about twenty feet from the base of the stump. Then he walked off, not beginning to wave his wings in the "lure-pattern" (Williamson, 1948:95, footnote) until he had gone several feet over the ground and was almost screened from me by rocks and foliage.

The nestlings, not over thirteen hours of age and probably a good deal less, were already dry and could sit up. Their pink skin was well shaded, but by no means concealed, by rather long, straw-colored, hair-like down. The bill was dusky, becoming blacker toward the end, but the tips of *both* mandibles were whitish and each was equipped with a hard, light-colored egg tooth. Their tightly closed eyes were mere blackish bumps on the sides of the head. Their legs and feet were flesh-color. The shells of both eggs had quite vanished. Because I had seen nothing of them while watching the nest continuously since there had been enough daylight to distinguish anything, I concluded that the female had disposed of them by eating or carrying them away during the night, or more probably in the dim light of early dawn.

After this examination of the nestling doves, I promptly returned to the blind. At 9:22 I saw the male approaching over the ground. While still some distance from the nest he stopped behind a log and stood for two minutes surveying the situation with only his head visible to me. Then he resumed his march toward the nest, where he arrived at 9:27 after an absence of 17 minutes. He brought nothing in his bill. At 10:08 he began to feed a nestling, in all probability its first meal. Certainly during the few minutes he was out of my sight he could not have gathered enough food for this meal and all those which now followed. Unlike male birds of other families, he did not need to see the nestlings, or at least to see his mate gather food for them, before he was prepared to feed them himself. He already had food for them when he came in the early morning before he had ever laid eyes on them. The production of "pigeon milk" in his crop had been synchronized with their hatching.

During the next half-hour the male dove fed the nestlings at least four times more, each feeding lasting from a fraction of a minute to $6\frac{1}{2}$ minutes. The male always sat with his head away from me, making it impossible for me to see the details of feeding. At 10:33 I left the blind. I already had a better record of the care of recently hatched nestlings, made at an earlier nesting of this same pair. At 12:10 p.m. I returned and found the male dove still giving frequent meals to his offspring. During the next half-hour he fed the young by regurgitation four times, the meals lasting from about one to five minutes. After 12:37 no more food was passed, although the dove continued to sit quietly on the nest.

At 1:57 the female dove came walking from the east, paused near the nest, then circled around and approached by a crooked course from the north. The male, contrary to his usual custom, did not move, although he could hardly have failed to see her. She stood for several minutes motionless on a rock about five yards from the nest, then walked nearer. Her mate at last began to stir, but was slow in leaving. At 2:11 she flew up to the stump, arriving just as he was taking wing. This was the only time at this nesting that I saw one member of the pair reach the nest before the other had flown. At 2:15 I left the female brooding.

Returning next morning, I was dismayed to find that the nestlings had vanished. Many of their mother's feathers were scattered over the stump and the surrounding ground. I found only one flight feather and no blood. While watching from the blind the preceding day, I had seen a tayra and an opossum prowling in the vicinity. Either of these omnivorous mammals might have eaten the newly hatched doves.

One and two days old.—For a more complete picture of the care given to the nestlings and their development we must go back in time to the first nest (6a) on the same stump. On June 5 we found two eggs on this stump, far advanced in incubation. They hatched on June 7 between 6:40 a.m. and 1:00 p.m. I then set up the blind and returned to it at dawn the following morning, when the nestlings were less than twenty-four hours old. At 5:45, while the light was still dim, the male silently arrived and flew up to the top of the stump, whereupon the female left at once. For the next two hours and fifteen minutes he sat nearly motionless facing away from me, but at 8:00 he turned to face me. He backed off the center of the nest and picked up the main part of an empty shell, which had lain in the nest for nearly if not quite twenty-four hours after the nestling escaped from it. The other empty shell had been inadvertently thrown to the ground by the male as he flew from the nest when I visited it just after the nestlings hatched the preceding day. Now he promptly let the remaining shell drop from his bill back into the nest. Soon he picked it up and dropped it again.

At 8:03, after he had been on the nest for well over two hours, he gave a nestling its first meal of the day. Then for the next three-quarters of an hour he continued alternately, and at times even simultaneously, to be busy with feeding the nestlings and trying with more or less success to eat the shell; and this dual occupation led to some amusing situations. For the first half-hour after he had begun to be interested in the shell he repeatedly picked it up only to drop it again. Sometimes he took it in his bill as far up as it would go, and at times he dropped it when a nestling insistently stretched up its head for food. Although he billed the shell so often, he did not seem actually to eat any of it until about 8:30, when holding the main part of the empty egg as far up in his mouth as the closed bottom of the shell would permit, he broke off and ate small particles from the ragged edge. After ten minutes of this occupation had materially reduced the size of the shell, he made heroic efforts to gulp down the fairly large piece that remained, continuing this for five minutes. While he was so engaged, a nestling became hungry and stretched up for food. Still holding the shell in one side of his mouth, the dove took the nestling's bill in the other side and for two minutes regurgitated "pigeon milk" to it. Then he dropped the nestling's bill but continued to hold and eat the shell. Finally he gulped down the remaining piece. He had devoted no less than three-quarters of an hour to feeding on that shell!

Since the dove alternately ate shell and fed the nestlings, I wondered whether he did not regurgitate to them part of the shell, which seemed a harsh diet for day-old doves. Similarly, at this and other nests I saw the parent Quail-Doves eat the nestlings' droppings a short while before feeding them. Years earlier, I watched a male Cassin Dove (*Leptotila cassini*) eat the droppings which had accumulated on the nest during the night before proceeding to give the nestlings their breakfast. In these instances, is the waste material fed back to the youngsters, or is there some arrangement of by-passes in the pigeon's alimentary canal which prevents this?

The feeding of the nestlings occurred intermittently over the period from 8:03 to 10:26, during which their father regurgitated to them 14 times: 6 times from 8:03 to 9:00, 5 times from 9:00 to 10:00, 3 times between 10:00 and 10:26. Nearly always a single nestling received food at a feeding; yet once he fed them alternately, then apparently simultaneously, but with the bills of both in his mouth on the same side—not on opposite sides as when the nestlings are older—and continued this for about a minute. On this first morning the male dove invariably took the nestling's bill into the left side of his own mouth and held it there from about $\frac{1}{2}$ to $2\frac{3}{4}$ minutes while regurgitating. The nestling's bill went into the parent's mouth up to the eyes. In regurgitating food, the parent expanded his thorax strongly, then contracted it, doing this repeatedly, but not continuously, during the whole time he kept the nestling's mouth in his. Intervals of rest appeared to alternate with active pumping up of aliment. From 10:26 until 12:00 the male dove rested almost motionless brooding the nestlings, without further feeding. At noon observations were stopped.

Returning to the blind at 12:50 p.m., I found that the female dove had during my absence replaced the male on the nest. The sky had become clouded. After an hour a drizzle fell and slowly

increased in intensity. The female continued to cover the nestlings, scarcely moving save now and then to pick up and eat their droppings. Finally, at 3:19, a nestling stretched up its head and she at last began to feed it, continuing for about 6 minutes. Two minutes after the termination of this feeding she delivered food again, beginning with a single nestling; but soon the other managed blindly to insert its bill into her mouth on the opposite side, and she regurgitated to both simultaneously. This feeding lasted for 3 minutes and 10 seconds. During the next 10 minutes she fed twice more, a single nestling each time, first for 3 and then for $1\frac{1}{2}$ minutes. Thus, between 3:19 and 3:44 she fed the nestlings 4 times. Then for the next hour she brooded quietly with the nestlings resting quietly beneath her. At 4:52 one of them pushed its head out from beneath her breast and bobbed it about as though hungry. The mother billed the back of its head but gave it no food, and after a few minutes it returned beneath her. But an hour later, when the light beneath the woodland had become so dim that I had difficulty in seeing what she did, the female began another series of feedings. The first of these started at 5:55 and lasted 5 minutes; then followed 3 more feedings lasting about 2 minutes, 2 minutes and 1 minute, the last of these terminating at 6:10, when even through the binoculars I could hardly distinguish details. If still other meals followed, they were hidden from me by the dusk.

On June 9 I entered the blind at 11:50 a.m. to watch the nest during the hour when I had been absent the preceding day. The male dove was covering the nestlings and remained until 12:34 p.m., when he flew from the stump as his mate came to rest on a swinging vine close beside it. After a delay of 7 minutes she jumped to the top of the stump and settled down with the nestlings in front of her. Although she billed them gently, they did not rise up for food. A few minutes later she again touched them with her bill and both stretched up their heads to receive their meal, placing their bills into her mouth from opposite sides. This feeding, which began at 12:50, was the first of 5, which ranged in length from 4 to 13 minutes, and in aggregate occupied 33 minutes. The last and longest ended at 1:32, after which the nestlings retired beneath their mother and remained out of sight. Most of the time the two-day-old nestlings were fed simultaneously, with their bills entering their mother's mouth from opposite sides. At times the bill of one would drop out, and it would grope blindly around until it stuck it in and continued to receive food.

The nestlings had grown enormously during the two days since they had hatched. The skin covering the body had darkened somewhat during the interval and appeared more naked because as it expanded with their growth the filaments of natal down became more widely separated. Their feet and toes had become considerably darker. Both nestlings kept their eyes closed except when touched or otherwise disturbed, when they would open them partly. The one which was apparently slightly older could open its eyes about half-way; the other, which experienced more difficulty in keeping its bill in its mother's mouth at meal-time, for only a narrow slit. When they felt themselves slipping from my hands, the young doves hooked their bills over my fingers and tried to draw themselves up.

Four days old.—By June 10, when the nestlings were three days old, their pinfeathers were sprouting and those of the remiges had already become long and conspicuous. On June 11, when the young doves were four days of age, I watched the nest continuously from daybreak until nightfall. The female dove was on the nest at the end of the night and flew off at 6:03. Three minutes later the male came walking over the ground but passed close by the stump that held the nest. A minute later he flew up to it, and three minutes after his arrival began to give the nestlings, both together, a meal which lasted nine minutes, from 6:10 to 6:19. A second feeding lasted four minutes, from 6:25 to 6:29; and a third two minutes, from 6:31 to 6:33. In these fifteen minutes of regurgitation the male dove apparently exhausted his supply of "pigeon milk"; when two hours later a nestling rose up and ran its bill over its father's bill and face, it received nothing. From time to time the parent picked up and swallowed the droppings which the little ones had deposited on the side of the nest.

The male continued to brood the nestlings for nearly five hours. Mosquitoes were abundant in the woodland and hovered in a restless swarm above the brooding dove's head, causing him to keep it in continual jerky movement, at the same time blinking his eyes with great frequency, in an effort to keep them from settling down. During the morning I enjoyed several opportunities to observe the dove's behavior in the face of

disturbances and alarms of various sorts. A squirrel jumped to a neighboring trunk at a point only a foot from the nest, passing rapidly and appearing not to notice it. As the animal went by, the bird depressed the foreparts of his body, just as he and his mate were in the habit of doing when I came near. He likewise lowered his head and breast when domestic chickens scratched in the woodland only fifty feet away. Somewhat later in the morning the dove again assumed this crouching attitude, but now in a form more exaggerated than I witnessed at any other time. His breast was pressed down against the nest and his posterior parts elevated until his tail pointed almost straight upward. He remained motionless in this peculiar pose for a number of minutes, and at first I could discover no cause for it. Finally, I noticed four red-billed Frantzius's Araçaris (*Pteroglossus frantzii*) in the trees above us. When the great-billed nest-robbers discovered the blind in which I sat, they called out in great excitement, repeating high, sharp notes that seemed weak for birds so large. After a while they drifted away, and the dove gradually resumed his normal sitting posture, his head bent slightly downward, body nearly horizontal, and tail inclined only slightly upward.

Years earlier I had seen a Cassin Dove assume a similar pose when Rainbow-billed Toucans (*Ramphastos sulphuratus*) passed through the tree-tops above the nest where he brooded his nestlings. The dove lowered his head and neck like the Quail-Dove, but instead of elevating his tail so prominently he partly spread his wings, as the latter did not do. Later, when a troupe of white-faced monkeys passed over this same nest, the female did not, as I had expected, depress her foreparts—although I have first-hand evidence that white-faces are nest-robbers like toucans. Both Cassin Doves and Quail-Doves are forest-dwelling species which have the forehead, foreneck and breast much lighter in color than the crown, back and wings, and their action in lowering the foreparts of the body when enemies approach renders them less conspicuous, especially from above.

At 8:13 a female Ruddy Quail-Dove, doubtless the mate of the brooding male, walked close by the nest, but without stopping disappeared in the undergrowth. The male covering his nestlings seemed not to notice her. (It was most exceptional to see either member of the pair in the vicinity of the nest except when it came to feed or brood the nestlings.) At 10:48 the male swallowed droppings and flew away as his mate came walking toward the nest. When about two yards from it, she stopped. For the next two and a half hours she remained standing on the same spot of ground, immobile, or at times preening. She did not move when an agouti hopped by only three yards from her. Finally, at 1:14, she stretched her legs, then walked forward two feet, delayed here four minutes more, then vanished behind the stump on which the nest rested. After remaining here out of my sight for nearly half an hour, she went to the nest by way of the vine that swung close beside the stump. Within a minute of her arrival on the stump she began to feed both nestlings together, keeping their bills in her mouth for 15 minutes while a light rain began to fall. This was followed after a short interval by a feeding which lasted 8 minutes and then by another of 4 minutes' duration.

I continued to watch for the remainder of the rainy afternoon, staying constantly in the blind except for a period of a quarter of an hour, when I was driven to a more distant observation post by a horde of army ants, which invaded my retreat and swarmed over its walls of brown cloth. I feared that they would discover the nest and abruptly terminate my study; but fortunately they passed it by; and when they had moved on, I resumed my more comfortable seat in the blind. The female dove, who all this while had continued quietly to cover her nestlings without feeding them again, at last flew off spontaneously, at 4:57. During her absence of 28 minutes rain fell hard.

Returning at 5:25, she settled over the nestlings with her tail toward me. This unfavorable position made it difficult to follow what she did; although I continued to watch her intently through the rain and the gloom, I saw nothing to suggest that she fed the nestlings again at nightfall, as she had done on the day after they hatched.

Seven days old.—On June 14, when the nestling doves were seven days old and the plumage beginning to expand on their bodies and wings but not on their heads, I again spent the whole day watching them from the blind. At 5:40 a.m., when the light was still dim beneath the trees, the female flew from the nest on which she had passed the night. At 5:58 the male came walking over the ground, but instead of going to the nest passed it by and continued until lost from sight. I did not see him again until 7:49 when he returned, again walking, and when two yards from the stump flew up to the nest and began at once to give the nestlings, both together, a meal which lasted ten minutes. At the end of the feeding he shook their bills from his mouth; when they rose up begging for more food, he turned his head away. At last they sank down with their heads beneath his breast. He did not stay long to brood them; only seven minutes after the single feeding he ate the droppings that had been deposited beside the nest, then flew away, at 8:06.

Now for more than three hours the partially feathered nestlings were left quite alone. At times they preened a little, but mostly they drowsed with their heads down. When toward noon a spot of sunlight slipping through the high woodland canopy fell upon the nest, one youngster stretched its head high and panted violently, moving around a good deal. At 11:35 the female approached, walking over the ground as usual, but stopped when four feet from the base of the stump. Here she stood motionless as she had done three days earlier, but not for so long a time. Just at noon, after only 25 minutes of immobility, she flew up to the vine that swung beside the nest, thence to the nest itself. The youngsters appeared not to be eager for food but continued to lie inert in front of their mother, who did not cover them. Almost an hour and a half passed before, at 1:24, she suddenly began to feed both together, continuing for six minutes. Then one nestling stuck its head beneath its mother's breast, leaving the hindquarters exposed. The other reached up for more nourishment, but received nothing. After an hour, however, both were fed again for six minutes.

Soon the usual afternoon rain began to fall, causing the nestlings to retire beneath their mother, who sat very high, puffed out all her feathers, and rested her bill against the swelling plumage of her chest. The rain collected on her back and wings in shining drops which rolled off without penetrating her feathers. At times she twitched her head forward, apparently to shake off the drops. At 4:50, when the rain, not so hard as on most afternoons at this season, had diminished to a mere drizzle, the dove flew from the nest and remained away for half an hour. After her return at 5:19, the nestlings rose up to beg for food; but although I watched until they faded from view in the rain-drenched dusk, they received no more nourishment that afternoon.

Summary of observations at nest 6a.—As the nestling doves grew older, they were fed less frequently but seemed to receive more at each feeding. On June 8, the day after they hatched, the two nestlings were fed 14 times by the male and 8 times by the female—a total of 22 feedings, counting as a single feeding each time the parent took a nestling's mouth into his own. The feedings fell into three series: by the male between 8:03 and 10:26 a.m. and by the female between 3:19 and 3:44 p.m. and between 5:55 and 6:10 p.m. With rare exceptions the nestlings were fed one at a time, and single feedings lasted from a fraction of a minute to 3 or 4 or rarely 5 or 6 minutes. (From observations made on the succeeding day, I doubt that the nestlings were fed during my absence of fifty minutes on this day.)

On June 11, when 4 days old, the two nestlings were fed 3 times by their father and 3 times by their mother, a total of 6 feedings. The male fed between 6:10 and 6:33 a.m., the female between 1:46 and 2:22 p.m. The two nestlings were regularly fed simultaneously, with their bills on opposite sides of the parent's mouth. The feedings by the male lasted 9, 4 and 2 minutes; those by the female 15, 8 and 4 minutes.

On June 14, the seven-day old nestlings were fed once by the male and twice by the female, a total of 3 feedings. The male fed between 7:49 and 7:59 a.m.; the female

between 1:24 and 2:35 p.m. The feeding by the male lasted 10 minutes, those by the female 6 minutes each.

An effort was made to determine the total number of minutes devoted to meals. The intervals when the nestlings' bills were held in the parent's mouth were timed with a watch. On the day after they hatched it was sometimes difficult to see them plainly when the parent sat with its head away from me, and it was not possible to measure the periods of feeding with exactness. On this day the 14 feedings by the male lasted a total of about 21.5 minutes, the 8 feedings by the female 23.5 minutes. By both parents the nestlings were fed for about 45 minutes. When 4 days old the nestlings were fed a total of 15 minutes by the male and 27 minutes by the female, giving 42 minutes by both together. When 7 days old they were fed 10 minutes by the male and 12 by the female, or 22 minutes in all. In considering these figures, it should be remembered that the day-old nestlings were with rare exceptions fed one at a time, while from their fourth day onward they were regularly fed simultaneously. Assuming that on the day after hatching the two nestlings were nourished more or less equally, when one day old, each was fed about half as long as when they were four days old; but when they were seven days old, the time they devoted to taking food fell to what it had been on the day after they hatched. Even while the nestlings' mouths were within that of the parent, they did not appear to receive food in a continuous stream, but rather intermittently.

The amount of time which the parents spent at the nest diminished as the nestlings grew older. On the day after the eggs hatched the parents were continuously present. When the nestlings were four days old, the male flew off when his mate arrived at 10:48, then for nearly three hours the nestlings were left without close attendance while their mother rested on the ground near the nest; she did not actually go to the nest until 1:45 p.m. Late that same afternoon she left the nestlings exposed to a hard rain while she took a brief recess from 4:57 to 5:25. When the nestlings were seven days old their mother, who had formerly waited on the nest until the male arrived to replace her in the early morning, flew off at 5:40; he did not appear until 5:58 and did not actually go to the nest until 7:49, with the result that the nestlings were left alone for slightly more than two hours. A few minutes after he had finished feeding the nestlings he flew away, and they were unattended for nearly four hours, from 8:06 until their mother's arrival at 12:02. That same afternoon she took a recess of almost half an hour, from 4:50 until 5:19. Thus, the week-old nestlings were left alone for $6\frac{1}{2}$ hours, or slightly more than half of the day.

Care of older nestlings at other nests.—At the two nests of the Ruddy Quail-Dove which I watched briefly in 1942, the behavior of the parents was essentially the same as at the nest studied in 1947; yet there were some interesting variations.

One of these, nest 3, had been built in a forest upon a fallen palm frond that had been caught up by bushes and vines seven feet above the ground. On June 8, when the nestlings were six days old, I watched their nest from daybreak until 11:30 a.m. The female had passed the night on the nest. At 5:35, while the light was still very dim beneath the high forest, I was made aware of the approach of the male dove by hearing soft, deep cooing from the undergrowth. He stood in one spot on the ground, close in front of the blind, and cooed repeatedly, then advanced a few paces and cooed more. At the nest I studied in 1947 the parents always approached in silence. The female then flew from the nest, and almost at once the male flew up to it. Without delay he took the nestlings' bills in his mouth, one on each side, and held them there for 25 minutes, although only a fraction of this period appeared to be occupied by the intermittent acts of regurgitation, made evident by the strong movements of the parent's head and body, and separated by longer intervals of repose.

Nest 2, found in the forest near my house on April 27, 1942, contained two nestlings which were fairly well feathered except for their heads and appeared to be seven or eight days old. They remained in the nest at least four days more, and my studies made during this period give a picture of the care

of nestlings somewhat older than those watched in 1947. On the morning of April 29 the male arrived at 5:45, announcing his approach through the undergrowth, as at nest 3, by low, deep-voiced *coos*. Feeding followed. The next morning he came silently, fed the nestlings for seven minutes, and left. The nestlings remained alone until the female winged up silently at 8:52 and fed them continuously for 3 minutes. Then for nearly two hours she sat at the side of the nest with the nestlings in front of her; but at 10:40 she flew off, leaving them alone for the rest of the day. The nestlings from time to time stood up and vigorously flapped their wings, which bore rapidly expanding plumes. They took this exercise after each meal; and during the afternoon, when they remained all alone in the intermittent rain, the impact of the first heavy drops of each shower stimulated them to energetic wing-flapping. At the beginning of a shower one walked out on one of the flat aroid leaves that supported the nest, but soon returned to rest beside the other. The little spurt of activity caused by the first rain drops would soon die away; and the nestlings would then passively endure the continued downpour, with their feathers all puffed out and heads drawn in. At the end of the long, wet afternoon the female dove returned at 5:31, when the light was growing dim. For three minutes she fed the wet youngsters, then carefully removed their droppings from the nest, swallowing them. She tried to brood the nestlings but found them too big to be covered. They stuck their heads beneath the ruffled feathers of her breast, leaving their feathered bodies exposed to the rain; and in this attitude I left the trio in the dripping forest when I left in the dusk. It is noteworthy that at this nest the female gave well feathered nestlings a second feeding at the end of the day, whereas at the 1947 nest this late feeding was observed only when the nestlings were one day old.

Comparison with other species.—In the great family of pigeons considerable uniformity appears to prevail in the pattern of incubation, the male sitting through much of the day, the female covering the eggs from some time in the afternoon until her mate returns next morning. There are differences among genera, however, in the mode of caring for the nestlings. Here we have space only to point out something of the range of variation. At a nest of the Cassin Dove (*Leptotila cassini*), young in pin feathers, still attended almost continuously by their parents, were fed only thrice in a day, by the male when he came to brood them at about 9 in the morning, by the female after she arrived to replace him at 4:30 in the afternoon and again by her, quite briefly, three-quarters of an hour later. Although this nest had not been found and studied before the eggs hatched, the parent doves appeared to have continued the same schedule of attendance which they had followed during the course of incubation; and each fed the nestlings copiously when it came to take its turn at brooding, with perhaps an additional snack during the ensuing hour.

More often, apparently, the parent pigeons, soon after the eggs hatch, change the time of their visits to the nest. At a nest of the Blue Ground Dove (*Claravis pretiosa*), the parents maintained, during the first three days after the nestlings hatched, essentially the same schedule of attendance as they had earlier followed while incubating the eggs. During their first few days the nestlings received, through most of the day, numerous feedings from whichever parent was present. By the time the young Blue Ground Doves were six days old, the parents had made great changes in their attendance. The nestlings were now left alone most of the time. The male came twice during the morning, at each visit simultaneously giving both nestlings a single substantial feeding and then flying away. The mother likewise came twice, but during the afternoon. On her first visit early in the afternoon she gave both nestlings together a single good meal, then flew away. Returning again in the middle of the afternoon, she gave the nestlings a three-minute feed, then remained with them until nightfall, giving them three additional shorter feedings during the next hour and a half.

At a nest of the Talpacoti Dove (*Columbigallina talpacoti*) likewise, the parents continued to follow essentially the same schedule of attendance during the first days after their eggs hatched as during the course of incubation. In contrast to the schedule of feeding followed by the Quail-Doves, at nests of both the Blue Ground Dove and the

Talpacoti Dove each parent came twice daily to attend the nestlings when they were about a week old; but with the Blue Ground Dove the male came twice and then the female came twice, whereas with the Talpacoti Dove the parents alternated in their visits.

At both of these nests feedings became fewer but undoubtedly more copious as the youngsters grew older. Likewise at both, the nestlings were at first fed singly, or only exceptionally both together; later they were usually fed simultaneously, with their heads on opposite sides of the parent. The change from single to simultaneous feeding occurred at about the time the nestlings' eyes opened, at the age of about three days for the Blue Ground Dove, four days for the Talpacoti Dove. So long as the young were sightless, sticking their bills into their parent's mouth at the same time was a matter of blind luck and did not often occur; after they could see, they experienced no difficulty in sharing each meal, except at times when only one was hungry.

Greatly in contrast to the manner of feeding the nestlings that I have observed in *Oreopelia*, *Leptotila*, *Claravis* and *Columbigallina* was that at a nest of the Band-tailed Pigeon (*Columba fasciata*) studied by Neff and Niedrach (1946:74). Here the female was not seen to feed the nestling until after it was twenty days old. During its first week the male delivered food thrice daily, between noon and three o'clock in the afternoon. During the second week the number of meals was reduced to two, given by the male each day between noon and 1:30 p.m.

Although exceptional, pigeons are not unique among birds in feeding their young less often as these grow older. According to Tanner (1941) a pair of Ivory-billed Woodpeckers (*Campephilus principalis*) fed newly hatched young about 30 times a day, but later decreased the rate to 15 times. The Gray Woodpeckers (*Picus canus*) studied by Bussmann (1944) increased the rate of feeding from 9 on the first day to 26 on the seventeenth day, when the young reached adult weight; thereafter the rate dropped to 15 feedings per day at the time the young left the nest. Woodpeckers of the genus *Picus* resemble pigeons in regurgitating food in the form of a milky paste. Reduction in the number of feedings is, however, by no means invariable among birds that deliver food by regurgitation, and perhaps not even general. Among hummingbirds (*Colibri*, *Hylocharis*) and the aberrant honeycreeper *Diglossa*, I observed an increase in the rate of feeding as the young grew older.

DEPARTURE OF THE NESTLINGS

It may be recalled that at the nest found in 1947 atop a stump, the nestlings' eyes began to open when they were two days old. A day later they bore sprouting pinfeathers, those of the remiges longest and most conspicuous. When the nestlings were seven days old their plumage began to break out from the ends of the horny sheaths and to expand. The expansion of the feathers of the wings, both remiges and coverts, was particularly rapid, and when only eight days of age the young doves appeared to be fairly well clothed with plumage so long as they kept their wings folded, but were rather naked when they lifted them. The contour feathers of the body had just begun to expand and those on the head were all still tightly enclosed in their sheaths.

When I touched these eight-day-old doves and gently lifted their wings, they made no move to escape. A little gray fly flew out from their plumage where it had been lurking and alighted on a neighboring leaf. Thoughtlessly I made a brusque movement to catch it, and this caused one of the youngsters to hop from the nest. I at once captured it; but as soon as I set it down beside its nest-mate on top of the stump, it jumped off again and started to walk over the ground in the most competent fashion, as though it had long been in the habit of taking solitary promenades. Again I overtook it and replaced it on the nest. This time it stayed. But when I returned less than an hour

later it had gone, leaving alone the nestling that was the older by possibly a few hours. This youngster lingered two days more, leaving the nest between nine o'clock and noon on June 17, when ten days of age.

The following morning I found one of these young doves on the ground close by the stump where it had grown up. As I approached, it took wing and flew low over the ground for possibly ten yards, then walked rapidly off. When I followed, it rose again, flew about 25 yards and vanished amidst the undergrowth. At the age of only eleven days it was well able to keep out of harm's way.

At nest 3, found in 1942 on a dead palm frond, the nestlings departed in somewhat different fashion. Approaching this nest on the morning of June 12, I found the female sitting on it, with the two nestlings resting beside rather than beneath her. She remained motionless until I came within three or four feet, then suddenly flew off. Almost at the same instant, the two nestlings also took flight, and each of the three went in a different direction. The young doves, only ten days old, flew amazingly well and were soon out of sight amidst the undergrowth. It seemed incredible that the egg from which one of these doves hatched had been laid no more than 21 days before. No other bird that I have ever studied flies so well at so early an age, whether counted from the date of laying the egg or the date of hatching. Other birds which fly equally well upon leaving the nest remain longer in its shelter, after longer periods of incubation. Hummingbirds linger in the nest from 18 to 24 days, after 16 days of incubation; kingfishers and motmots a month more or less, after at least three weeks of incubation; woodpeckers a month or more, after 13 or more days of incubation; trogons from 15 to 30 days, after 18 or 19 of incubation. Even passeriform birds develop less rapidly. Swallows, which as a rule fly well when they depart the nest, are three or four weeks old, and hatch from eggs incubated about 15 days; tanagers to fly well must linger in the nest from 16 to 24 days, after 13 or 14 of incubation. One might proceed indefinitely to cite examples of far slower development than that of the Ruddy Quail-Dove, among birds placed higher in the evolutionary scale. Mound-birds of Australia, on the contrary, are said to fly the day they hatch; but their period of incubation is longer than the combined incubation and nestling periods of the doves. Thus, their flight is preceded by a longer period of development.

At nest 3, it seemed that the female Quail-Dove's abrupt departure, rather than my own approach, was the signal for the flight of her nestlings. Some years earlier I had seen almost the same thing at a nest of the White-fronted Dove (*Leptotila verreauxi*): When I approached the brooding parent, it jumped from the low nest and fluttered over the ground as though injured, and then the well-feathered nestling flew off in the opposite direction. In this manner the parent pigeon may help the nestlings to escape in the face of danger. Also, if the nestlings are too young to flee, the parent might defend them against a predator by striking vigorously with its wings in the usual columbine fashion. Thus, the long periods spent on the nest by the parent Quail-Doves, especially the female, when they do not actually cover the older nestlings, might be interpreted as guarding rather than brooding. They are guarding while they sit on the nest beside the nestlings just as Brown Jays (*Psilorhinus mexicanus*), Boat-billed Flycatchers (*Megarhynchus pitangua*) and other birds guard while standing beside it. The nestling Ruddy Quail-Doves at the first nest found in 1942 allowed me to come and stand beside them after they were more fully feathered, and presumably older, than the two which with their mother flew from the nest as I approached. This was apparently because at the time of my visits neither parent happened to be present to stir them by its own abrupt departure.

It is instructive to compare the 10-day nestling period of the Ruddy Quail-Dove

with the 12 or occasionally 14 days of the Talpacoti Dove; the 14 or 15 days of the White-fronted Dove; 12 days for the Inca Dove (Anderson and Anderson, 1948:153); 18 days for the Turtle-Dove and 26 to 35 days for British species of *Columba* (Witherby, *et al.*, 1940:129-146); 30 days for the Band-tailed Pigeon (Neff and Niedrach, 1946:74).

At the time of quitting the nest, the Ruddy Quail-Doves wore a plumage different from that of either parent. The feathers of back and wings were deep olive-brown, with deep buffy-brown tips that contrasted sharply with the ground color. Their eyes were dark brown and their queerly down-bent bills blackish. Their heads were still naked except for the bristly natal down and the sprouting pin-feathers. After their departure their nest was quite clean, unsoiled by the droppings which accumulate on the nests of many kinds of pigeons. The parents had removed and eaten all waste matter.

ADAPTATIONS OF THE RUDDY QUAIL-DOVE FOR LIFE IN THE FOREST

Whole families of the most abundant and characteristic birds of the neotropical region are absent from the Antilles, and few small land birds are common to the mainland of tropical America and the West Indies. The Ruddy Quail-Dove is an exception. It is present, with only slight racial variation, throughout nearly the whole of the forested lowlands of tropical America, continental and insular (except the Lesser Antilles). In what respects is *Oreopeleia montana* particularly fitted for life in the lowland forests? Although pigeons of numerous species inhabit tropical America, most of them dwell in open or bushy country; and of those that live in the forests the majority frequent the tree-tops. Relatively few inhabit the dimly illuminated forest floor where the Ruddy Quail-Dove is at home. How does this pigeon differ from those which live in sunnier situations?

Although in the sunshine the Ruddy Quail-Dove, particularly the male, appears brightly clad in his rich rufous-chestnut glossed with reddish-purple, in deep shadow both sexes are dull and blend well with the brown carpet of fallen leaves, readily escaping notice so long as they remain motionless. Habitually quiet and retiring, upon the approach of a man they steal discreetly away and are difficult to detect. Their nest, even slighter and more frail than that of most pigeons, is usually well concealed by the surrounding vegetation, and the mingled green and brown of the leaves which enter so largely into its composition assimilate it into the adjacent foliage and bark. The buff-colored eggs are likewise less conspicuous than the shining white eggs of nearly all other pigeons. Although some pigeons, including species of *Columbigallina*, *Leptotila* and *Claravis*, keep their first white egg rather constantly covered until the second is laid and incubation regularly begun, the Ruddy Quail-Dove leaves its buffy egg exposed during this interval. Apparently the tinted egg is less likely to attract a predatory eye, and there is less need to keep it concealed beneath the sitting bird.

In the tropical forest where an amazingly high proportion of all eggs and nestlings are taken by predators, the rapid passage of the developing bird through these vulnerable stages is of the greatest importance to the survival of the species. Antbirds and manakins, whose nests are among those most frequently found in the undergrowth of the forest, have, for small passerine birds, long incubation periods but short or moderately long nestling periods, those of some of the antbirds being particularly short. But the Ruddy Quail-Dove is by its rapid development even better fitted to pass through the perils of the tropical forest, for both incubation and nestling periods are exceptionally short, not only for pigeons but for birds as a whole. After only eleven days of development within the shell and eight more as a nestling, the young dove can walk in a competent fashion; and two days later it can fly too well to be captured by a man.

By keeping their nests perfectly clean, the Quail-Doves also appear to increase the probability of escaping predation. Although a few other pigeons, including species of *Leptotila* (some of which dwell in the tropical forest), likewise remove all excrement from the nest, attention to the sanitation of the nest appears to be exceptional in the family. The Scaled Pigeon (*Columba speciosa*) and Red-billed Pigeon (*C. flavirostris*) keep the nest clean for a number of days after the nestlings hatch, but afterwards neglect to remove droppings; while Talpacoti Doves and Blue Ground Doves are at all times careless of cleanliness, with the result that their nests become very foul.

SUMMARY

The Ruddy Quail-Dove (*Oreopeleia montana*) inhabits humid lowland forests, up to 3000 or 4000 feet above sea-level. It forages over the ground, eating fallen fruits and small invertebrates, and unless closely pressed prefers to walk rather than to fly.

North of the Equator it appears to breed chiefly from April through June. In the basin of El General in southern Costa Rica, seven sets of eggs were found between April and mid-July, but only one of these sets was laid later than June.

The nest is placed amidst the undergrowth of the forest at heights of from one to eight feet, in a bush, atop a stump, or on any flat surface that will support it. The slight platform consists of coarse twigs and leaves, many of which are green when brought by the doves.

The full set consists regularly of two eggs, which are buff or cream-color rather than pure white as with most pigeons. Unlike many pigeons, the Quail-Doves do not keep the nest covered during the interval between laying the first and second eggs.

Incubation is carried on by both parents. The male covers the nest most of the day; the female replaces him about the middle of the afternoon and sits until he returns next morning. At one nest the male arrived later on succeeding days, until at the middle of the incubation period he would come at about 8 o'clock; then as the eggs neared the point of hatching he came earlier again, between 6:30 and 7:00 on the last two days of incubation. Through most of the incubation period the female arrived to relieve the male between 3:30 and 5:00 p.m., but when the eggs were about to hatch she came earlier, just as the male did. In the middle of the incubation period the male's daily session on the eggs lasted from 8 to 9 hours.

The doves approached the nest by walking over the ground. When coming to take a turn on the eggs, they usually brought a twiglet or a green or dying leaf for the nest.

When danger threatened, the doves, whether covering eggs or young, would lower head and breast and elevate the tail, at the same time compressing their plumage to make themselves appear smaller. This attitude was taken in its extreme form when toucans passed overhead.

At one nest the period of incubation of the second egg was 11 days 10 hours \pm 8 hours, at another it was 10 or 11 days.

One male with great effort disposed of an empty shell by swallowing it.

Both parents fed the young. During the first day after hatching the nestlings were fed one at a time, but when two days old they inserted their bills at opposite sides of the parent's mouth and were fed simultaneously, this method then prevailing until they left the nest.

Day-old nestlings were fed 22 times in a day, but as they grew older they received fewer meals per day until when about a week old they were given only three. The male then fed once daily, generally before sunrise, and soon after delivering the meal flew away, to remain out of sight until the following morning. The female, who generally fed older nestlings twice daily, was less regular in her schedule, feeding twice in the

early afternoon, or at another nest once in the middle of the morning and once late in the afternoon. The feedings of recently hatched nestlings lasted from a fraction of a minute to 3 or 4 or rarely 5 or 6 minutes. Older nestlings sometimes kept their bills in the parent's mouth for 10 or 15 minutes continuously, and once for 25 minutes.

The parents kept the nest perfectly clean at all times, swallowing all droppings after feeding the nestlings or, with younger nestlings, in the intervals between feedings.

When frightened, an eight-day-old nestling jumped to the ground and walked off in a competent fashion. Three other doves departed at the age of ten days, when they could fly amazingly well.

One pair, which reared a brood of two young at least to the age of nest-leaving, laid a second set of eggs on the reconditioned nest, a month after the departure of their first brood.

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San Isidro del General, Costa Rica, September 14, 1948.

AVIAN FOSSILS FROM THE MARINE PLEISTOCENE OF SOUTHERN CALIFORNIA

By HILDEGARDE HOWARD

Recent discoveries of fossil birds in the Upper Pleistocene deposits near Newport Bay, California, have suggested the advisability of reviewing the entire marine avifauna of southern California of that age. Pertinent fossil material in the collections of the Los Angeles County Museum has been supplemented by specimens from the University of California, the California Institute of Technology, and the collection of Dr. Loye Miller. The courtesy of these loans is gratefully acknowledged. Loans of modern comparative material were obtained through the kindness of Dr. Alexander Wetmore and Dr. Miller.

I wish to take this opportunity to thank Mr. George Kanakoff, invertebrate paleontologist in charge of the Los Angeles County Museum's excavations at Newport Bay, for the attention he has devoted to the collecting of the avian fossils, and Mr. Fred Feltham for his generous aid in this field project, as well as for several specimens which he personally collected.

Including the Newport site, eight Upper Pleistocene occurrences of marine birds have been reported from southern California, as follows:

Newport Bay

Santa Rosa Island (Howard, 1944)

Bixby Slough (Howard, 1944)

San Pedro, Second and Orizaba Streets (Howard, 1944)

Playa del Rey (Howard, 1936)

Santa Monica (Miller, 1925)

San Pedro, lumber yard (Miller, 1914, 1930)

The combined collections of avian fossils from these localities total 190 specimens, of which 100 are newly recorded at this time. Forty-eight of the 100 are from the Newport Bay site, and 52 are from the previously recorded localities at San Pedro (lumber yard), Santa Monica, and Playa del Rey.

NEWPORT BAY

The bird-bearing Upper Pleistocene deposits of the Newport area occur in a dry canyon and higher adjacent gullies of the mesas on the east side of the upper end of Newport Bay. At this locality the Pleistocene sand lies unconformably over Pliocene siltstone. The Los Angeles County Museum's first excavations in the area were carried on intermittently through 1940, 1941 and 1942. In this time only invertebrates were recovered (Willett, 1944, 1948). In 1946 and 1947 more intensive work resulted in the recovery of both bird and mammal remains in addition to shells. Most of the bird bones were found in a short gully which joins the main canyon from the west about 15 feet above the bottom of the dry creek bed. A few were taken from the east bank of the main canyon. The bones are petrified. Most of them are broken and the condyles are slightly abraded. The matrix is a coarse, soft sandstone.

Forty-one of the 48 bird bones found are specifically identifiable and are assigned to sixteen different species. Only one, the large diving duck, *Chendytes lawi*, can be said to be abundant. Sixteen specimens represent this curious bird. Four bones of the Sooty Shearwater (*Puffinus griseus*) were found; no other species is represented by more than three specimens.

A list of the identified specimens follows. Pertinent information concerning the individual species is included in the general discussion of all materials now at hand.

- Gavia arctica*? Incomplete humerus, L. A. Mus. no. 2017.
Gavia immer. Incomplete carpometacarpus, no. 2032; shaft of humerus (unnumbered, tentative).
Aechmophorus occidentalis. Fragment of left ramus of lower mandible, L. A. Mus. no. 2023.
Diomedea albatrus. Two distal ends of tibiotarsi, nos. 2016 and 2054; 1 incomplete humerus, no. 2055.
Puffinus griseus. Distal end of tibiotarsus, no. 2028; coracoid, no. 2044. Fragments of tibiotarsus and carpometacarpus, nos. 2049 and 2045 (tentative).
Puffinus opisthomelas? Wing phalanx (unnumbered).
Fulmarus glacialis. Humerus, no. 2019; ulna, no. 2046; proximal end radius, no. 2047.
Phalacrocorax penicillatus. Proximal half of ulna, no. 2018.
Morus reykana. Proximal end of tarsometatarsus, no. 2052; radius, no. 2043; fragment of shaft of humerus, no. 2052A (tentative).
Branta canadensis? Distal fragment of carpometacarpus, no. 2020.
Anser albifrons? Fragment of tibiotarsus, no. 2022.
Aythya valisineria? Shaft of ulna (unnumbered).
Melanitta deglandi? Shaft of femur, no. 2024.
Chendytes lawi. Coracoid, no. 2042; humerus, no. 2030; 4 femora, nos. 2015, 2027, 2031, 2057; 1 tibiotarsus, no. 2015; 2 tarsometatarsi, nos. 2026, 2050; 3 pedal phalanges, no. 2025; 3 vertebrae, no. 2056; fragment of pelvis, no. 2055.
Stercorarius sp. Humerus, no. 2029.
Larus sp. Fragmentary coracoid, no. 2051.

PREVIOUSLY RECORDED LOCALITIES

The material available for this study includes practically all of the recorded avian bones from the Upper Pleistocene marine deposits of southern California. These have been carefully reviewed and a few changes made in identifications.

The 52 additional specimens, previously unrecorded, represent for the most part material collected since the first reports on the localities concerned. Abbreviations used to designate the collections in which the specimens occur are as follows: University of California Museum of Paleontology (U.C.); California Institute of Technology Department of Vertebrate Paleontology (C.I.T.); the Loye Miller collection at the University of California at Los Angeles (Miller); and the Los Angeles County Museum (L.A.M.).

List of previously unrecorded specimens from San Pedro (lumber yard), Santa Monica, and Playa del Rey

- Gavia immer*? Ulna, U.C. "Lot 24," San Pedro.
 †*Gavia arctica*. Scapula, Miller, San Pedro.
Aechmophorus occidentalis. 2 tibiotarsi, U.C. no. 21093 and Miller, both San Pedro.
Colymbus auritus? Carpometacarpus, U.C. no. 21095, San Pedro.
 **Colymbus nigricollis*. Coracoid, Miller, San Pedro.
Diomedea albatrus? Ulna, U.C. "Lot 19," San Pedro.
Puffinus opisthomelas. Scapula, Miller, San Pedro.
Puffinus griseus. Humerus, C.I.T., San Pedro.
Phalacrocorax penicillatus. Coracoid, Miller, San Pedro.
Branta canadensis? Radius, L.A.M. no. 683, San Pedro.
Branta nigricans? Tarsometatarsus, U.C., San Pedro.
 **Mareca americana*. Ulna, U.C. no. 21094, San Pedro.
Anas carolinensis? Ulna and humerus, Miller; ulna, U.C. "Lot 10"; all San Pedro.
 **Bucephala albeola*. Femur, U.C. 21088, San Pedro.
 †*Melanitta deglandi*. Humerus, Miller; coracoid, U.C. "Lot 22"; both San Pedro.
Melanitta perspicillata. Tarsometatarsus, U.C., San Pedro.
Chendytes lawi. 4 femora, U.C. nos. 21091, 21089, L.A.M. no. 2014, and Miller; partial pelvis with sacrum, Miller; 2 fragments sacrum, U.C. no. 21092; 2 pedal phalanges, U.C. and C.I.T.; 3 tibiotarsi, Miller and L.A.M. no. 2010; 1 vertebra, U.C.; all from San Pedro. 1 femur, Miller, Santa Monica; 3 vertebrae, 1 femur, 1 fibula, L.A.M. nos. 989, 2013, and 999, Playa del Rey.

Duck, sp. Tibiotarsus, U.C. "Lot 28"; carpometacarpus and humerus, Miller; all from San Pedro.
Fulica americana. Carpometacarpus, L.A.M. no. 684 (tentative); 2 humeri, U.C. no. 21100 (one uncatalogued); all from San Pedro.

**Limosa fedoa*? Fragment of tarsometatarsus, U.C. no. 21094, San Pedro.

**Ptychoramphus aleuticus*. Carpometacarpus, U.C. "Lot 28," San Pedro.

Alcidae, sp. (possibly *Synthliboramphus*). Humerus, San Pedro; ulna, Santa Monica. Both Miller.
Lophortyx californica. Femur and coracoid, Miller, San Pedro.

**Falco sparverius*. Tibiotarsus, Miller, San Pedro.

* New record for locality named.

† New record for southern California Pleistocene.

DISCUSSION

Gavia arctica and *Gavia immer*.—Of the two specimens here assigned to *Gavia arctica*, the one from Newport is too worn for more than a tentative identification; the scapula from San Pedro, however, is in good condition and is clearly distinguishable from *G. stellata* by the greater flare of the acromion and the flatter coracoidal articulation.

The carpometacarpus from Newport which is assigned to *Gavia immer* is in a good state of preservation and is so nearly identical with modern specimens available that I feel justified in making the allocation. The tentatively listed specimens, from Newport and San Pedro, are incomplete.

It is unfortunate that the difficulty in exactly determining the specific identity of fossil specimens has resulted in the omission of the genus *Gavia* as a member of the Pleistocene avifauna in the check-list of fossil birds of North America. Previous records have listed a large form from San Pedro and Playa del Rey, presumably *Gavia immer*, and a smaller one from San Pedro, listed as *Gavia* sp. (Miller, 1914:37). The latter record was based on an incomplete femur longer and more slender than specimens of *Gavia arctica* or *G. stellata* then available for comparison. This fossil femur is now at hand (U.C. no. 21057). In the series of modern skeletons of *G. arctica* at the Los Angeles County Museum, there are femora even longer than this fossil, and one which is more slender. I believe, therefore, that the San Pedro specimen is assignable to *Gavia arctica*.

Aechmophorus occidentalis.—The lower mandible from Newport coincides closely with comparable Recent specimens of the modern Western Grebe except for slightly larger size. The larger dimension is in keeping with the character of the Pleistocene representation of *Aechmophorus* noted at Fossil Lake, Oregon (Howard, 1946:148). The distal fragment of tibiotarsus from San Pedro is in good condition, and measurements of the condylar area are above the average for the modern grebe (breadth, 10.7 mm.; depth of external condyle, 11.5 mm.). The proximal fragment cannot be accurately measured but does not appear to be large.

Among previously recorded specimens of *Aechmophorus* from San Pedro (Miller, 1930:117), a nearly complete humerus shows a breadth of distal end of 12.2 mm. which is well above the average for the modern Western Grebe (11.0 mm.). It also exceeds the average of the series of humeri from Fossil Lake, Oregon (11.2 mm.). Of two femora of *Aechmophorus* recorded from Playa del Rey (Howard, 1936:211), one, with distal end intact, exceeds both modern and Fossil Lake series in depth and breadth of shaft. In the other specimen the shaft is broader than in the modern series, but the measurement of depth of shaft falls within the modern range, although above the average. Two fragmentary specimens, a humerus from San Pedro, and a sternum from Playa del Rey, cannot be measured.

Of the eight specimens of Western Grebe available from the Pleistocene marine deposits of southern California, five are now found to exceed the average of comparable elements of Recent birds (2 from San Pedro, 2 from Playa del Rey, and 1 from New-

port Bay). It is strongly indicated, therefore, that in the Pleistocene the Western Grebe was larger all along the coast than it is today. The trinomial distinction accorded the Oregon representation (*Aechmophorus occidentalis lucasi*) might appropriately be applied to the California specimens as well.

Colymbus auritus and *Colymbus nigricollis*.—The carpometacarpus from San Pedro tentatively assigned to the Horned Grebe resembles *Colymbus* but is too large for *C. nigricollis* and too small for *C. parvus*. Measurements fall within the range of those taken on a series of modern specimens of *C. auritus*. However, they do not agree with any one specimen available, appearing rather stockier in proportions.

The coracoid from San Pedro assigned to *Colymbus nigricollis* is a fraction of a millimeter smaller than the minimum modern specimen available. It should be noted that the series of small grebe coracoids from Fossil Lake, Oregon, also contains specimens of lesser size than the modern specimens. With the small series of both modern and fossil grebe bones now at hand, it would be unwise to state that the Pleistocene Eared Grebe averaged smaller than the living bird, although the possibility should be kept in mind as more fossils become available.

Diomedea albatrus.—Albatross remains have been reported before from the Upper Pleistocene of California: at San Pedro, *Diomedea* near *nigripes* (Miller, 1914:34) and *Diomedea* sp. (Miller, 1930:117); and at Playa del Rey, *Diomedea albatrus* (Howard, 1936:212). These specimens have been examined in the course of this study; the larger one from San Pedro, reported as *Diomedea* sp., is an incomplete tarsometatarsus which is larger in distal dimension than any available specimens of *D. albatrus* but appears to agree with that measurement on skins of *Diomedea immutabilis*. Further study should be made of this specimen when skeletons of the latter species are available.

The bones here recorded from Newport agree in all particulars with specimens from the kitchen middens of California which have been identified as *Diomedea albatrus*. The distal end of an ulna from San Pedro agrees in shaft size with this kitchen middens material; no available comparative specimen of ulna has the distal end intact.

Fulmarus glacialis.—In the available series of 14 humeri of the Recent Pacific Fulmar (half of which were kindly measured by Dr. Loye Miller in his collection), the range in length is from 98.7 mm. to 110.2 mm., with an average of 103.4 mm. The fossil humerus from Newport is about 3 mm. smaller than the minimum of this modern series, measuring in greatest linear dimension 95.4 mm. Otherwise it is identical with the modern bones. The ulna falls within the size range of modern specimens. The radius is too fragmentary to measure.

There is one other Pleistocene record of the Fulmar, from the lumber yard locality of San Pedro (Miller, 1914:35). The specimen, a carpometacarpus, is not available at this time, so no determination of its size can be made.

Phalacrocorax penicillatus and *Phalacrocorax auritus*.—The specimens here recorded from Newport and San Pedro provide the first conclusive evidence of the occurrence of *P. penicillatus* in the Pleistocene, although it has been tentatively recorded from the San Pedro deposits on the basis of a femur (Miller, 1914:35) and a tarsometatarsus (Miller, 1930:117). Examination of these San Pedro specimens now indicates that the tarsometatarsus can be definitely assigned to *P. penicillatus*, being distinguished from *P. auritus* in the greater flatness across the distal end. The femur, however, lacks the excavation below the head anteriorly which is characteristic of *penicillatus* and should be assigned to *P. auritus*.

An incomplete tarsometatarsus with distal end intact from Santa Monica, formerly assigned to *P. auritus* (Miller, 1925:147), is now thought to belong to *P. penicillatus* by reason of its flatness across the anterior surface, and abrupt, short middle trochlea.

The ulna and coracoid herein assigned to *P. penicillatus* are distinguished from *P. auritus* as follows: ulna, greater extent of impression of brachialis anticus muscle and nature of tricipital and bicipital attachments; coracoid, intermuscular line situated farther from the medial border.

Moris reyna.—Three specimens from Newport are assignable to the Sulidae. The tarsometatarsus is allocated to *Moris* in distinction to *Sula* on the basis of the presence of three separate calcaneal ridges in the hypotarsus, very small proximal foramina, and less pneumaticity of the element as a whole. The specimen exhibits about the same size relationship to comparable specimens of *Moris bassana* as is true of the coracoid described as *Moris reyna* (Howard, 1936:213) from the Playa del Rey locality about 40 miles to the north. For this reason I have assigned the tarsometatarsus to the extinct species.

The radius resembles *Moris* in its stoutness just below the head and in the depression of the bicipital attachment. Like the tarsometatarsus, the radius is slightly smaller than in *M. bassana*, and is assigned to *M. reyna*. Although it is likely that the humerus belongs with the other bones, it is too fragmentary to attempt a definite allocation.

Histrionicus histrionicus?—A distal end of a humerus (U.C. no. 21096 from San Pedro was originally assigned to *Anas carolinensis* (Miller, 1914:35), but proves on comparison with additional modern material to be that of a nyrocine duck indistinguishable from the Harlequin.

Spatula clypeata.—A tibiotarsus and coracoid (U.C. no. 29032) from San Pedro, now referred to the Shoveller, were previously assigned to *Anas cyanoptera* with the remark that they appeared too stout for the comparative material than available (Miller, 1914:36).

Melanitta deglandi and *Melanitta perspicillata*.—The shaft of a femur from Newport, tentatively assigned to *M. deglandi*, resembles comparable Recent specimens of that species but is slightly larger (breadth of shaft, 5.3 mm.; depth of shaft, 6.7 mm.; *M. deglandi*, breadth, 4.4-5.0 mm.; depth, 5.7-6.4 mm.). The bone is too slender to belong to the large diving duck *Chendytes*.

A poorly preserved proximal end of a humerus previously assigned to *Melanitta perspicillata* (Miller, 1930:117) is now referred to *M. deglandi* on the basis of its large size. The humerus newly listed from San Pedro (a distal end) shows the same state of preservation and possibly represents the other half of this same bone.

Chendytes lawi.—In addition to the specimens of *Chendytes* from known Pleistocene strata, three fragments of leg bones were found in an Indian site at Malaga Cove (Southwest Museum Coll. no. 1011; E. C. Walker ms.). These appear to have been carried to the site by human hands, presumably from nearby fossil beds. Dr. Loye Miller has in his collection seven well preserved specimens (1 tarsometatarsus, 2 femora, 3 tibiotarsi, 1 fragment of sacrum) from an unknown locality. They were brought to him many years ago with a collection of kitchen midden bones from San Nicolas Island, but as no similar material has ever been found on San Nicolas, it is believed that the fossil bones were taken elsewhere and secondarily associated with the island material. The bones are well petrified in distinction to the typical kitchen midden preservation noted in other specimens.

The occurrence of *Chendytes* at Newport was previously recorded (Howard, 1947:76) in connection with two degenerate wing elements which point conclusively to the flightlessness of the bird and to its dependence on the pelvic limbs for swimming. Unfortunately no additional specimens of wing elements have come to light since.

Previous reports on *Chendytes* have discussed the femur, tibiotarsus, and tarsometatarsus at some length (Miller, 1925; 1930:117). The pelvis and the pedal phalanges

now available merit some description. The shape of the centrum of the anteriormost synsacral vertebra closely resembles that of the mergansers in its diminished dorsoventral depth. In the scoters and in the geese the centrum is as deep or deeper than it is wide. The steep slope of the sides of the ilia also resembles the condition in the mergansers, as well as in the geese. The ilia are united at the midline at least in the area just anterior to the acetabulae. They are broken away beyond this point so that the condition cannot be observed. The line of union appears to be narrow, not broad as in the geese. Openings between the ilia and the spines of the synsacral vertebrae noted in the mergansers and scoters are lacking in *Chendytes*; in this character the fossil bird resembles the geese. The phalanges are similar to those of the scoters except for much larger size.

With the large number of specimens of *Chendytes* now available the general characteristics of the bird have become more evident. The degenerate nature of the available wing elements contrasts markedly with the condition noted in such flightless swimmers as the penguins, Great Auk, or the Pliocene *Mancalla*. These birds though unable to use the wings in the air, used them for under-water progression. *Chendytes* is likened, rather, to the flightless cormorant of the Galapagos Islands, *Nannopterum harrisi*, in which the swimming power is in the legs. In body size *Chendytes* appears to have been close to *Nannopterum* (breadth of pelvis: *Nannopterum* 40 mm., *Chendytes* 37 mm.?). The length of the tarsometatarsus, also, is similar in the two birds. The femur and tibiotarsus, however, are longer in *Chendytes*, and the coracoid and humerus are markedly shorter.

Measurements of *Chendytes* and *Nannopterum*

	<i>Chendytes</i>	<i>Nannopterum</i>
Length of tarsometatarsus	63- 66 mm.	64.5 mm.
Length of tibiotarsus	134 mm.	120.0 mm.
Length of femur	67- 73 mm.	58.0 mm.
Length of coracoid	48- 50? mm.	56.0 mm.
Length of humerus	70? mm.	89.5 mm.

Relative to the length of the humerus, the average length of the femur in *Chendytes* is 100 per cent, in *Nannopterum* 64 per cent, in a flying cormorant 37 per cent, and in the scoters 50 per cent.

Stercorarius sp.—The jaeger humerus from Newport is in two pieces with one point of contact preserved. Its length of 125.6 mm. exceeds that of the average for *Stercorarius pomarinus* by 12.5 mm., but falls short of the type of *S. shufeldti* from Fossil Lake, Oregon, by 13.5 mm. Probably the specimen is not as nearly intermediate between the two species as these figures would suggest. Compared with a maximum humerus of *S. pomarinus* the difference is but 6.5 mm. Possibly the fossil represents an ancestral form of *pomarinus* which attained greater size than its living descendants. However, in view of the fact that the bone is considerably broken away at the points where distinguishing characters might be present, it is thought wise to allocate it generically only.

Larus sp.—The gull coracoid from Newport appears to belong to a bird of about the size of *Larus glaucescens*, although it is more slender than available modern specimens of that species. Comparison with a cast of the type of *Larus robustus* from Fossil Lake shows the two bones to be nearly equal in length, but the Oregon specimen appears more robust. Unfortunately the breakage of the proximal end and the general erosion of the Newport specimen have destroyed any distinctive characters it may have had.

Although possibly of no significance, it is worthy of comment that at Newport, as at Fossil Lake, there occurs a humerus ascribed to a large jaeger and a coracoid ascribed to a large gull. In both instances the generic allocation of the humeri to *Stercorarius* and the coracoids to *Larus* seems entirely justified. But as there is considerable simi-

larity in the coracoids of the two genera, the parallel occurrence at the two localities should be borne in mind as Pleistocene studies of birds advance.

SURVEY OF PLEISTOCENE MARINE AVIFAUNA

By way of summary of present information, the accompanying table lists all avian species known from Upper Pleistocene marine localities in southern California. The number of specimens now available is indicated both by locality and in totals for each species.

Compared with well over a hundred different kinds of birds which can be found along our shores today, the 38 forms listed from the Pleistocene seem pitifully few. We can, however, observe general trends of occurrence in this small sample available as fossils. Certain families, such as the loons, grebes, shearwaters, and ducks, may be considered abundant. The albatrosses, cormorants, and alcids may be called fairly common. These are all occurrences that could be expected, coinciding as they do with present conditions.

In contrast, however, there is a complete, or nearly complete absence of pelicans, gulls, and waders. Of the latter group, many different forms are known to have lived around inland lakes and ponds of this region in the Pleistocene by evidence presented from the Rancho La Brea and McKittrick deposits. Possibly none of the marine deposits so far encountered has represented the particular type of shore environment suitable for these shallow-water birds.

The rarity of the gulls and the total absence of the pelicans is remarkable. Gulls occurred in good numbers in the Fossil Lake deposits of Oregon with at least 3 species determinable. Can it be that the northern location of breeding areas of the majority of gulls today is reminiscent of a restricted northerly distribution of this family in the Pleistocene? Possibly the warmer climate which the southern coast is believed to have enjoyed at that time has some bearing on this matter.

Regarding the pelicans, Dr. Loye Miller has voiced the thought in oral discussion that owing to their great pneumaticity the bones of pelicans were too fragile to preserve well in spite of their large size. However, the White Pelican has appeared in two inland fossil deposits, and quantities of Brown Pelican bones, not greatly fragmented, are found in Indian kitchen middens of Recent age along our shores. The only alternative to Dr. Miller's theory appears to be the assumption that these birds were not part of the coastal scene in the Pleistocene.

The dominant marine bird of the Pleistocene here was apparently the flightless diver, *Chendytes*. Its abundant fossil representation relative to that of other species suggests its presence in numbers reminiscent of the Great Auk of northern waters and more recent time. There is as yet no record of the species elsewhere than in southern California.

Though the San Pedro deposits have yielded more specimens than any of the other localities, comparisons are possible between this assemblage and those from Newport Bay and Playa del Rey. It is first of all notable that *Chendytes* was a more dominant member of the avifauna at the last-named localities than at San Pedro. Although the actual number of specimens of *Chendytes* from San Pedro slightly exceeds that from Newport or Playa del Rey, proportionate abundance is much greater at the latter localities (48 per cent of the total number of specimens at Playa del Rey, 39 per cent at Newport, and only 21 per cent at San Pedro). Furthermore, careful search through all available material from San Pedro fails to reveal any specimens of the fragile wing elements. In the Newport deposit a humerus and coracoid were found; at Playa del Rey a coracoid.

Other differences in the deposits seem to be associated with environmental conditions. The birds found at Newport and at Playa del Rey suggest a more strictly marine

List of Avian Species Now Known from Upper Pleistocene Marine Deposits in Southern California

	LSP	OSP	PDR	SM	BS	SRI	NB	Total specimens
<i>Gavia immer</i>	2?		1?				2	5
<i>Gavia arctica</i>	2						1?	3
<i>Colymbus auritus?</i>	1							1
<i>Colymbus nigricollis</i>	1							1
<i>Aechmophorus occidentalis</i>	4		3				1	8
<i>Diomedea nigripes?</i>	1							1
<i>Diomedea albatrus</i>	1?		2				3	6
<i>Diomedea</i> sp.	1							1
<i>Puffinus opisthomelas</i>	2		2				1?	5
<i>Puffinus griseus</i>	2		1				4	7
<i>Fulmarus glacialis</i>	1						3	4
<i>Phalacrocorax auritus</i>	1			1				2
<i>Phalacrocorax penicillatus</i>	2			1			1	4
* <i>Morus reykana</i>			2				3	5
<i>Branta canadensis</i>	2					5	1?	8
<i>Branta nigricans?</i>	1							1
<i>Anser albifrons</i>	1						1?	2
<i>Anas platyrhynchos</i>	7					1?		8
<i>Anas carolinensis</i>	4					1		5
<i>Mareca americana</i>	1							1
Teal, sp.	1							1
Duck, sp.	3		1				1	5
<i>Histrionicus histrionicus?</i>	1							1
<i>Bucephala albeola</i>	1							1
<i>Spatula clypeata</i>	2							2
<i>Melanitta deglandi</i>	3						1?	4
<i>Melanitta perspicillata</i>	4							4
* <i>Chendytes lawi</i>	19		13	2	1		16	51
<i>Fulica americana</i>	2 (3?)							3
<i>Limosa fedoa?</i>	1							1
* <i>Stercorarius</i> sp.							1	1
<i>Larus glaucescens</i>	1						1?	2
<i>Synthliboramphus antiquus</i>	1 (2?)			1?				3
<i>Ptychoramphus aleuticus</i>	1							1
<i>Uria aalge</i>			1					1
<i>Cathartes aura</i>	1							1
<i>Haliaeetus leucocephalus</i>	1							1
<i>Lophortyx californica</i>	5	1						6
<i>Falco sparverius</i>	1							1
<i>Sturnella neglecta</i>	1							1
<i>Corvus corax</i>			1					1
Totals identifiable	88	1	27	5	1	7	41	170
Misc. unidentifiable	7		6				7	20
GRAND TOTALS	95	1	33	5	1	7	48	190

LSP, Lumber Yard, San Pedro; OSP, Second and Orizaba, San Pedro; PDR, Playa del Rey; SM, Santa Monica; BS, Bixby Slough; SRI, Santa Rosa Island; NB, Newport Bay.

influence than do those from San Pedro. Ten per cent of the specimens from San Pedro represent land birds (five species). No land birds have been found at Newport, and only one bone (of a raven) at Playa del Rey. Strictly oceanic birds comprise but 12.5 per cent of the San Pedro avifauna, compared with 37 per cent for Newport and 30 per cent

for Playa del Rey. The two alcids recorded from San Pedro which are absent at Newport are represented by only one or two specimens. As the total number of avian bones collected at San Pedro is more than twice that so far taken at the Newport locality, the absence of these less abundant species from the smaller collection is probably not significant. On the other hand, the occurrence of two species at Newport which do not appear in the San Pedro beds is noteworthy. One of these is the large extinct gannet which was described originally from Playa del Rey where two bones were found. At Newport there are two, possibly three specimens assignable to this bird. The other species is the large (presumably extinct) jaeger recorded here as *Stercorarius* sp. Both gannet and jaeger belong to groups of birds usually found off shore.

Although the possibility of an age difference between the Newport and Playa del Rey deposits and those of San Pedro should not be overlooked, it seems more likely that environmental factors may explain the occurrence of the gannet and the jaeger. As previously pointed out (Howard, 1936:211), the Playa del Rey deposits were probably laid down under 10 to 15 fathoms of water, which would indicate an offshore deposit. Of the "lumber yard" collections, Woodring (1946:95) says "It is inferred that this material was deposited in shallow current-swept marine water. That of the fresh-water and land animals except birds, were probably derived from the mainland and represent presumably drift carcasses stranded on the shore of an island formed by the Palos Verdes Hills during Palos Verdes time."

Mr. George Kanakoff has kindly furnished me with a tentative survey of the invertebrates of the Newport locality which indicates even less incidence of deep water forms and greater abundance of estuarine types than in the San Pedro deposits. The suggestion is therefore offered that the similarity of the Newport and Playa del Rey avifaunae as contrasted with that of the San Pedro area may in some way be associated with the occurrence of the latter locality on the leeward side of the island of Palos Verdes, whereas the other two areas were on the open coast.

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Los Angeles Museum, Los Angeles, California, April 15, 1948.

BIRD OBSERVATIONS AT JOHNSON RIVER, ALASKA

By LAWRENCE H. WALKINSHAW and JOHN J. STOPHLET

On June 1, 1946, accompanied by Jim Walkinshaw, we arrived at Bethel in the Yukon-Kuskokwim River delta region of Alaska. The next few days we made field trips into the surrounding tundra, and on June 4, Nat Browne, a local pilot, flew us out to the Johnson River cabin, about 30 miles west of Bethel. Here we remained until June 20 when Nat returned and flew Walkinshaw back to Bethel, then across to Chevak, a few miles east of Hooper Bay on the Kashunuk River, then along the Yukon as far east as Marshall and finally back to Bethel on June 23 where Stophlet and Jim Walkinshaw joined him.

Bethel is located at latitude $60^{\circ} 47'$ and longitude $161^{\circ} 41'$. It lies at an elevation of 28 feet and to the north and west is surrounded by tundra and lakes extending for



Fig. 1. Cotton sedge (*Eriophorum*) on tundra along bank of Johnson River, 30 miles west of Bethel, Alaska, June 18, 1946.

miles toward the Bering Sea and the Yukon. The Johnson River originates to the north and east of Bethel, about half way between the Yukon and Kuskokwim rivers and then flows southwest toward Baird Inlet. About 40 miles from Baird Inlet it changes its course to southeast, flowing into the Kuskokwim River between 25 and 35 miles below Bethel. We spent from June 4 to June 22, except as mentioned above, in a Reindeer Service cabin on the west bank of the Johnson River about 20 miles from the mouth of the river. The river, at this point, had a very swift current, was dark and deep, and about 200 meters wide. The tide raised it nearly a meter.

The weather of the Yukon-Kuskokwim River delta region was far from good. Rain fell at least 18 of the first 24 days of June and the percentage of cloudiness, according to the Bethel weather records, was over 80 per cent. On no day was the sky completely clear for 24 hours. The wind blew almost continuously and on days of wind and rain, with the temperatures often as low as 35° or 40° F., we shivered as we trudged through the mossy tundra. Mosquitoes swarmed about us after the middle of June.

There were deep drifts of snow in many places when we arrived on June 4, and we were unable to reach the Bering Sea region at that time because rivers were frozen. The Johnson River, however, was open.

Temperatures at Bethel recorded at the United States Weather Bureau showed a low for May of 12°F. on May 1. On this date the mean was 25°F.; on May 6, 26°F.; and on May 10, 46°F. After May 18 the mean temperature did not go below 40°F. until September 22. For June the mean was 50.8°F. and the high daily temperature varied between 44° and 70°; the low was between 35° and 51°, and the mean daily temperature between 42° and 60°. The highest wind velocity ranged between 9 and 36 miles per hour, daily, and although it rained frequently, only 1.13 inches of rain fell at Bethel during June, and the greatest amount in 24 hours was .18 inches on June 8. The ice left the Kuskokwim River between May 25 and May 28. In the fall it froze over on November 11, 1946.

At Bethel the sun rose on June 1 at 3:28 a.m. and set at 10:02 p.m., and on June 20 and 21, the longest days of the year, it rose at 3:12 a.m. and set at 10:25 p.m., Alaska



Fig. 2. View of tundra showing patches of low scrub. Johnson River, June 18, 1946.

Standard Time. During the month of June it does not get dark in the Johnson River area, the middle of the night being nothing more than a period of dusk.

Plants of the Alaska tundra have been well recorded by Palmer and Rouse (U. S. Dept. Int. Fish and Wildlife Research Rept. 10, 1945). Of the plants listed they say (p. 7) "the *Carex* and *Cladonia* species are dominants in the tundra climax. Subdominants include species of *Eriophorum*, *Ledum*, *Salix* and *Betula* (low growing forms), *Vaccinium*, *Empetrum nigrum*, *Arctous alpina* and *Rubus chamaemorus*. Prominent grasses are *Festuca*, *Poa*, *Arctagrostis*, and *Agrostis*. The most common mosses are *Sphagnum* and *Polytrichum*. Characteristic forbs include species of *Pedicularis*, *Polygonum*, *Chrysanthemum*, *Arnica*, *Gentiana*, *Saxifraga*, *Senecio*, *Polemonium*, *Campanula*, and the Arctic coltsfoot (*Petasites frigida*)."

Many of the plants here recorded have been identified by Henry Kyllingstad of Mountain Village, Alaska, and Dr. J. P. Anderson of Iowa State College, Ames, Iowa.

In addition to the great stretches of mosses and lichens found over the tundra, some of the tundra plants found west of the Johnson River were: Alaska tea (*Ledum decumbens*), alpine bearberry (*Arctostaphylos alpina*), dwarf birch (*Betula*), salmonberry

(*Rubus chamaemorus*), blueberry (*Vaccinium uliginosum*), salmonberry (*Vaccinium vitis-idaea*), and fernweed (*Pedicularis verticillata*) and in large waving patches scattered groups of large cotton sedge (*Eriophorum angustifolium*). The most common plant, other than the sedges, mosses and lichens, was the crowberry (*Empetrum nigrum*) and last year's berries of this plant were found in the stomachs of many birds.

During 165 hours in the field at Johnson River, Walkinshaw listed the species shown in table 1.

Table 1

Birds observed near the Johnson River, 30 miles west of Bethel, Alaska

Species	June	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
Arctic Loon		2		7	1	3	3	1	1	1	2	1	2	3	1	2	1	1	32
Red-necked Grebe		1	7	2	2	2	2	2		2	1		2				2	2	25
Whistling Swan			15	2		7						1	1				4		30
Canada Goose		2	8	7		5	5	2	3	2	1			4	3	4		2	48
White-fronted Goose				2			2						4	18	2		2		30
Mallard			3			1	2												6
Baldpate			2			1	1			2									6
Pintail		4		21	2	18	8	3	4	8	2	2	6	8	2	3	4	3	96
Green-winged Teal			1	1			1			1			2						6
Shoveller		1	3	2		5	4			4			2	1		1			23
Greater Scaup Duck			4		3	3	2			2	6		8	4	2		2		36
Oldsquaw		2	4			3	2			2	1	4	6	8	6	4	8	4	54
American Scoter				3		5	7						2				2	1	19
Marsh Hawk									1										1
Am. Rough-legged Hawk													1						1
Willow Ptarmigan		12	18	4	4	18	6		12	15	6	8	38	20	18	8	6	3	196
Sandhill Crane		4	19	6		9	1	1	2	6		4	3	4	3	4			70
Golden Plover			2		4	1	1	2		2	2	4	8	6	2	2	4		41
Black-bellied Plover		4	4	4	2	2	2		1	6	1	2	2	4	4	2	2	2	44
Wilson Snipe		2	8	6	4	15	6	3	2	4	1	8	12	12	10	3	2	2	100
Hudsonian Curlew			2	2		3			2	8		4	8	2	2	2	2		37
Spotted Sandpiper		1																	1
Dowitcher		1	2			2				2									7
Western Sandpiper		8	12	15	12	10	4	6	4	8	4	12	30	35	35	27	12	4	238
Pacific Godwit						1	1			1									3
Northern Phalarope		1	8	12	4	6	6	2		6		4	8	4	8	2	2		73
Pomarine Jaeger			1																1
Parasitic Jaeger			2	8	4	4	2			2	2		2	2					28
Long-tailed Jaeger		5	15	10	2	6	2	4	2	8	2	4	4	6	2	2	2	1	77
Glaucous Gull			2														1		3
Short-billed Gull		2	15	6	2	4	8	2		4		2	2	6	2	2	2	2	61
Arctic Tern		18	14	16	6	18	18	6		8		10	18	12	2	8	4	6	164
Short-eared Owl						1							1						2
Tree Swallow		2	2	2	2	6	2			4	2	2	4	4	4	2	2	2	42
Bank Swallow		18	6	6	18	25	55	18	8	6	4	18	28	50	30	18	18	16	342
Barn Swallow		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	34
Raven									1				1	1				1	4
Robin					1		1	1	1		2	2	2	2	4	2	1		19
Gray-cheeked Thrush		1	1	1	2	3	2	3	1	1	2	2	1	3	1	1	1	2	28
Yellow Wagtail		2	2	4	6	25	8	6	4	12	4	8	25	16	12	8	8	3	153
Yellow Warbler			4	3	3	4	2	2		2	1	3	4	2	2	2	3	2	37
Northern Water Thrush		1	2		2	2	3	1		1	1	1	2	2	1				19
Pileolated Warbler		1			1	2	2	1				1		1		1	1	1	14
Rusty Blackbird			1	2						8		2	2	2	2	1			20
Redpoll		2	3		2	8	15	8	5	8	18	7	7	10	6	3	4	6	112
Savannah Sparrow		8	16	8	6	15	6	8	6	10	2	8	12	10	10	8	10	3	146
Tree Sparrow		6	18	12	8	18	12	12	10	18	6	18	25	28	16	6	12	8	233
Fox Sparrow		1		2	3	3				2	2	4	6	2	2	2	2	1	32
Lapland Longspur		25	18	4	10	28	10		12	6	20	35	38	18	6	8	2	2	242
Total species		29	34	30	28	39	38	23	23	36	26	29	41	34	32	29	32	25	49
Total individuals		139	241	178	116	296	220	98	88	188	93	182	336	310	204	136	132	81	3038

Nestings of the Golden Plover, Black-bellied Plover, Hudsonian Curlew, Western Sandpiper, Northern Phalarope, Yellow Wagtail, Hoary Redpoll, Common Redpoll, and Tree Sparrow in this region have been reported by Walkinshaw (Condor, 50, 1948: 64-70, 220-223). The following completes the list of species which we found nesting within five miles of our cabin:

Branta canadensis. Canada Goose. A nest with eight eggs was located in a dense bed of horsetail (*Equisetum*) along a small lake shore June 5, 1946 (Walkinshaw).

Anser albifrons. White-fronted Goose. On June 9 Eskimos showed us a nest with six eggs and a nest was found by Walkinshaw on June 16 with six eggs. The nests were built on the open tundra, one far from water, the other adjacent to a small lake.

Anas acuta. Pintail. Nests were found on June 5 with seven eggs, on June 6 with eight eggs, on June 6 with five eggs, on June 8 with eight eggs, on June 17 with three eggs, and on June 19 with six eggs. Nests were located in the tundra near the marshes or far from the marshes on high tundra. They varied in diameter from 12.9 to 17.8 cm. and from 74 to 85 mm. in depth.



Fig. 3. Willow Ptarmigan on nest in tundra near Johnson River, Alaska, June 15, 1946.

Mareca americana. Baldpate. On June 8 John Stophlet and Jim Walkinshaw found a nest with seven eggs high up on the tundra above the river. On June 9 the eighth and last egg was laid.

Clangula hyemalis. Old-squaw. On June 8 Walkinshaw found a nest with three unmarked, cream-colored eggs near the shore of a small lake. On June 14 he found another nest hidden under dwarf birch right on the shore of a small lake. Usually the female sat very close until we were within a few meters, then she flew into the adjoining lake. On June 18 Stophlet found a nest some distance from any lake.

Lagopus lagopus. Willow Ptarmigan. Nests were found by Walkinshaw on June 11 and 12 with 10, 8, 9, 8 and 10 eggs, and a nest was shown to us by Eskimos on June 9 which contained 8 eggs. A male collected on June 10, 1946, by Walkinshaw showed considerable molting. It weighed 546.2 grams and had many crowberries (*Empetrum nigrum*), several darker berries as well as many buds from the alders in its stomach. The young in one nest hatched on June 18.

Grus canadensis. Sandhill Crane. On June 8, 1946, Walkinshaw found a nest with two eggs. The nest measured 38×33 cm. in diameter and was almost completely surrounded by *Empetrum nigrum* and associated tundra plants. On June 9 the Eskimos, Joseph Andrews and Isaac Tuntusuk, showed us a nest with one egg. The nest was located in a deep mossy ravine on the open tundra and measured 45.7×53.3 cm. across.

Capella delicata. Wilson Snipe. A nest was found on June 6, 1946, containing a full complement of three eggs. It was built under grasses and sedges in the moss with some crowberry, cranberry and Alaska tea hanging over it. It measured 100 mm. across and 77 mm. deep. Stophlet found a nest with four eggs.

Stercorarius parasiticus. Parasitic Jaeger. A nest built on a small knoll was found on June 6. It measured 53 mm. in depth and between 15.2 and 19 cm. across. The two spotted, gull-like eggs were dark gray-green. Both parents were present and greeted us on June 8, June 11 and June 15. The calls were a shrill *heeee* or a guttural *kaww*. Both flopped along on the tundra ahead of us as we approached and were more demonstrative the closer we approached the nest site.

Stercorarius longicaudus. Long-tailed Jaeger. A female taken on June 10 by Walkinshaw was in complete, unworn breeding plumage. She weighed 330.5 grams; largest ova were 4 mm. This bird had eaten some ptarmigan eggs and berries of *Empetrum nigrum*. At the nest these jaegers were quite tame. They were often observed chasing other birds near their nest. These included Sandhill Cranes, Hudsonian Curlews, Parasitic Jaegers and other Long-tailed Jaegers. Four nests were found. The first measured 41 mm. in depth and was 17.8×18.9 cm. in diameter; the second nest was 38 mm. deep, 110×113 mm. in diameter and the other two were merely depressions in the top of the mounds on which they were built. Each nest contained only one dark gray-green egg.



Fig. 4. Arctic Tern on nest. Johnson River, June 18, 1946.



Fig. 5. Long-tailed Jaeger. Johnson River, June 6, 1946.

These eggs were much darker than those of the Parasitic Jaeger and were covered with more and finer dark grayish spots concentrated at the larger end. None of the eggs had hatched by June 20. Calls given by the adults while we were in the nest vicinity were *heee-heee* and *yaeey-yaeey-yaeey*.

Larus canus. Short-billed Gull. A nest was found far out on open tundra partly covered with water by Walkinshaw on June 12, 1946. It was built on a low knob and as he approached the region, the gulls came out to meet him. They were much more vociferous when he approached the nest region, even attacking him when he finally reached the spot. The nest was 163 mm. in diameter and 33 mm. in depth and contained three grayish-green eggs sparingly covered with black spots. The parents chased intruders for over a mile after they visited the nest.

Sterna paradisaea. Arctic Tern. Isaac Tuntusuk found a nest with one egg on June 8. It was destroyed by June 15. Walkinshaw found a nest with two eggs on June 12. It measured 97 mm. in diameter and 23 mm. in depth. John Stophlet found a nest with one egg on June 17. The adults at both of these nests attacked us, repeatedly hitting us on our heads. The call was a shrill *keee*, sometimes a sharp *kik*. Nests were built on the small mounds found throughout the tundra.

Asio flammeus. Short-eared Owl. John Stophlet found a nest with five eggs on a small island in a marsh on June 8, 1946. One of the owls chased a Raven away from the nest.

Iridoprocne bicolor. Tree Swallow. We were surprised to find this species at Johnson River far from the nearest trees. One nested in a log building used for a cache near our cabin and Walkinshaw found a nest with six eggs on June 12. It was built in an old tin can lying on the tundra. The female was banded on June 15. She weighed 17.6 grams.

Riparia riparia. Bank Swallow. In examining the records of birds found near our Johnson River cabin this was found to be the most common species. This might be misleading because 28 nests dug into the high bank just a few hundred meters from the cabin were probably the only ones for quite some distance in any direction. The continual coursing back and forth of the Bank Swallow as it searched for food always brought many individuals within sight. A Bank Swallow egg was found on the bank underneath one of these holes on June 9. The burrows were about one meter beneath the top of the bank.

Hirundo rustica. Barn Swallow. A pair was found in an old sod igloo near our cabin and the remains of a last year's nest were fastened to a beam in the ceiling. On cold, windy days and during the dusky nights, both swallows stayed in this nest, side by side. Although both these swallows were there when we arrived on June 4, there was only one egg laid by June 20. Another pair nested in another nearby igloo.

Turdus migratorius. Robin. At Johnson River there were two pairs of Robins near our cabin. On June 11 Stophlet found a nest built on the ground at the base of an alder standing about one meter above it. It contained three young. The selection of the nest site was good because here on the ground the nest was able to withstand the terrific winds which whip across the area.

Hylocichla minima. Gray-cheeked Thrush. A male taken on June 14 by Walkinshaw weighed 34.1 grams. Thrushes were found in high tundra regions covered sparingly with alders.

Passerculus sandwichensis. Savannah Sparrow. At Johnson River nests were found as follows: June 4, 1946, three eggs; June 5, two nests with six and five eggs, respectively; June 6, four eggs; June 8, four eggs; June 12, five eggs. The average inside measurements of five nests were: depth, 55 mm. (48-60); inside diameter, 54.2 mm. (44.5-59.0).

Nests were built in lowland or highland tundra, under the grasses and sedges, often under dwarf birch and crowberry, and sunk into the moss so that their rims were even with the surface of the moss. The nests were made of grasses and sedges and were lined with fine grasses. This was one of the few small bird species whose nests were not lined with ptarmigan feathers.

A male taken on June 14 by Walkinshaw weighed 18.8 grams.

Calcarius lapponicus. Lapland Longspur. Two males were collected by Stophlet on June 11. They weighed 25.6 and 29.8 grams, respectively. A nest was found on June 8 by Walkinshaw with five eggs just five meters from a ptarmigan nest. A second nest was found the same day with three eggs, a third nest on June 15 with five eggs and another on June 17 with four young. The eggs were so heavily marked with brownish spots that no ground color was discernible.

An area of 60 acres was censused for breeding birds at Johnson River on the tundra area; another 20-acre area was censused along the Johnson River bank. These have been summarized by Walkinshaw, Stophlet and Walkinshaw (Audubon Mag., Breeding Bird Census, 1946:132-133). On these tundra plots only 70 pairs were found per 100 acres. Many areas had smaller populations. Censuses taken at Fairbanks and McGrath showed that the populations were definitely higher where spruce forests were present.

Battle Creek, Michigan, and Toledo, Ohio, August 15, 1947.

VARIATION IN THE NORTH AMERICAN FORMS OF
WESTERN FLYCATCHER

By PIERCE BRODKORB

Three subspecies of the Western Flycatcher are currently recognized in western North America, *Empidonax difficilis cineritius* from the mountains of northern and southern Baja California, *E. d. hellmayri* from the mountains of western Texas, and *E. d. difficilis* from the rest of western North America. Other races, not to be treated here, occur in Mexico and Central America. In addition Oberholser separated the birds of the Santa Barbara Islands, but this race has not been recognized by recent authors other than van Rossem (Trans. San Diego Soc. Nat. Hist., 6, 1931:264). Recently Moore (Proc. Biol. Soc. Wash., 53, 1940:24) described *Empidonax difficilis immodulatus* from Chihuahua and included the Santa Rita Mountains of Arizona within its range. Still later Woodbury and Russell (Bull. Univ. Utah, 35, 1945:77) and Behle (Condor, 50, 1948:72) extended the range of *hellmayri* to northern Arizona and Utah.

Specimens used in the present study are included in the collections of O. Dowell, Jr., Randolph Jenks, H. M. Laing, Dr. Max M. Peet, Carnegie Museum, Chicago Academy of Science, Chicago Natural History Museum, Cornell University, Museum of Comparative Zoology (including type and allotype of *cineritius*), Museum of Vertebrate Zoology, Royal Ontario Museum of Zoology, State College of Washington, Texas Agricultural and Mechanical College, United States National Museum (including types or cotypes of *difficilis*, *perplexus*, and *insulicola*), University of Michigan Museum of Zoology (including type of *hellmayri*), and University of Utah Museum of Zoology.

Along the Pacific coast there is little geographic variation from Alaska to southern California. Birds from this region are rather small (see table 1). The bill is short, and its lateral outlines are somewhat convex. The upper parts are brownish olive or citrine-drab. The wing bars and edgings of the remiges are olive-buff. The orbital ring is colonial buff. The chin and throat are olive-buff, more or less yellowish. The breast and sides are between deep olive-buff and dark olive-buff. The posterior under parts are primrose or barium yellow. The axillars are cream-buff, and the under wing coverts are chamois. As in other races of this species, the maxilla is blackish brown, the mandible ivory yellow, the iris dark brown, and the legs and feet fuscous.

Breeding specimens from the Sierra San Pedro Mártir, northern Baja California, show a slight decrease in wing length and a very slight increase in bill length. Birds from this area have been referred by Grinnell (Univ. Calif. Publ. Zool., 32, 1928:140) and others to *E. d. cineritius*, which was described from the Cape region of Baja California. The variation in bill size is in the direction of *cineritius*, but the wing variation is not. There is too much overlap to separate these birds taxonomically from *E. d. difficilis* of the Pacific coast region.

The Sierra de la Laguna, southern Baja California, is inhabited by *Empidonax difficilis cineritius*. This subspecies is characterized by very pale coloration and long, straight-sided bill. Above it is brownish with a yellowish green tinge. The wing bars are whitish. The throat is gray. The breast band is scarcely darker than the rest of the lower parts, being pale dull buffy. The belly and crissum are dull whitish yellow, with a slight buffy tinge.

The population breeding on the islands off the coast of California differs from *difficilis* of the mainland in having a slightly larger bill, longer tail, white wing bars, grayer back, average paler breast, and paler yellow belly. This appears to be a recognizable race, *Empidonax difficilis insulicola* Oberholser. In color it resembles *cineritius* more

Table 1
Average and Extreme Measurements of *Empidonax difficilis* in Millimeters

	Wing	Tail	Males	Culmen	Width of bill	Tarsus	Middle toe
<i>E. d. difficilis</i>							
3 Alaska	67.2 (67-67.5)	56.0 (54-59)		14.2 (14-14.5)	5.0	16.7 (16.5-17)	8.7 (8.5-9)
11 British Columbia	67.6 (63-70)	57.3 (54-59.5)		14.3 (13.5-15)	5.3 (5-5.5)	16.7 (16.5-17)	9.1 (8.5-9.5)
5 Washington	67.1 (65-68.5)	56.0 (52-60.5)		14.4 (13.5-15)	5.3 (5-5.8)	17.2 (16.5-18)	8.6 (8.5-9)
7 Oregon	67.8 (64-70)	56.1 (53.5-57.5)		14.3 (14-15)	5.2 (5-5.5)	16.3 (15.5-17)	8.7 (8.5-9)
11 Northern California	66.2 (63-68)	56.1 (51.5-60)		14.2 (14-14.5)	5.1 (5-5.5)	16.5 (16-17)	8.8 (8-9.5)
10 Southern California	67.0 (63-69.5)	57.4 (54.5-59.5)		14.3 (13.5-15)	5.1 (4.5-5.5)	16.7 (16-17.5)	8.8 (8.5-9.5)
47 Pacific coast	67.1 (63-70)	56.6 (57.5-60.5)		14.3 (13.5-15)	5.2 (4.5-5.8)	16.6 (15.5-18)	8.8 (8-9.5)
4 San Pedro Mártir (breeding)	64.9 (62.5-67)	57.5 (54.5-61)		14.5 (14-15)	5.2 (5-5.5)	16.6 (16-17)	8.6 (8-9.5)
5 Sonora	65.0 (62.5-67.5)	55.5 (53.5-58)		14.1 (13.5-14.5)	5.6 (5.5-5.8)	16.5 (16-17)	8.6 (8.5-9)
1 Eastern California	69.5	56.5		15.0	5.5	17.0	
19 Southern Arizona	67.7 (64-71)	56.4 (53-60)		14.2 (13.5-15)	5.5 (5-6)	16.7 (16-17.5)	8.9 (8.5-9.5)
<i>E. d. insulicola</i>							
9 California islands	68.0 (64-69.5)	60.0 (58-62.5)		14.6 (14-15)	5.6 (5.2-6)	17.8 (17.5-18)	8.9 (8.5-9.5)
<i>E. d. cineritius</i>							
12 Sierra Laguna	67.6 (63-69)	57.8 (55-60.5)		15.3 (14.5-16.2)	5.3 (5-5.5)	16.8 (16.5-17.5)	8.7 (8.5-9.2)
<i>E. d. hellmayri</i>							
13 Texas	73.6 (69-75.5)	61.3 (60-65)		15.5 (15-16)	6.4 (6-6.5)	17.3 (16.5-18)	9.4 (8.5-10)
4 Northern Arizona	73.6 (71-76)	61.4 (58-63.5)		15.6 (15-16.5)	6.1 (5.8-6.5)	17.4 (17-17.5)	9.5 (9-10)
6 Northern Rockies	71.4 (69-73.5)	60.3 (57-62.5)		15.2 (14-15.5)	5.8 (5.5-6)	17.7 (17.5-18)	9.2 (9-9.5)
4 Black Hills	70.3 (68-72)	59.5 (57.5-62.5)		14.5 (14-15)	5.9 (5.8-6)	17.3 (17-17.5)	9.3 (9-10)

		Females					
<i>E. d. difficilis</i>							
4	Alaska	62.9 (62-64)	53.6 (52.5-55)	13.0 (12-14)	4.9 (4.5-5)	16.1 (15-16.5)	8.5
2	British Columbia	62.8 (61-64.5)	53.5 (51.5-55.5)	14.3 (14-14.5)	5.3 (5-5.5)	16.0	8.5
1	Washington	65.0	57.5	14.5	5.0	17.0	8.5
1	Oregon	61.5	53.0	14.5	5.0	16.5	8.5
6	Northern California	61.8 (59-64)	54.4 (53-56.5)	13.9 (13-14.5)	5.1 (5-5.5)	15.5 (14.5-16.5)	8.1 (7.5-8.5)
8	Southern California	62.2 (59-65.5)	54.8 (53.5-57.5)	13.9 (13-14.5)	5.1 (5-5.5)	16.3 (16-16.5)	8.3 (8-8.5)
22	Pacific coast	62.3 (59-65.5)	54.5 (51.5-57.5)	13.8 (13-14.5)	5.1 (4.5-5.5)	16.0 (14.5-17)	8.3 (7.5-8.5)
6	San Pedro Mártir (breeding)	60.8 (59-63)	54.4 (52-57)	14.3 (13.5-15)	5.1 (4.5-5.5)	16.3 (15.5-17)	8.6 (8.2-9)
5	Sonora	62.0 (60-65)	52.7 (51-54.5)	14.1 (13.5-15.5)	5.4 (5.2-5.5)	16.5 (16-17)	8.6 (8.2-9)
11	Southern Arizona	64.4 (60.5-66.5)	54.6 (51-56.5)	14.0 (13.5-15)	5.4 (5-5.5)	16.5 (16-16.5)	8.9 (8.5-9.5)
1	Central Arizona	67.0	56.5	14.0	5.5	17.5	9.5
<i>E. d. insulicola</i>							
2	California islands	66.0 (64-68)	59.0 (57.5-60.5)	14.0	5.7 (5.5-5.8)	16.8 (16.5-17)	8.5
<i>E. d. cinerilius</i>							
5	Sierra Laguna	64.7 (63-66.5)	56.2 (56-57)	15.0 (14.5-15.5)	5.0 (4.5-5.5)	16.7 (16.2-17.5)	8.6 (8-9)
<i>E. d. helmayri</i>							
9	Texas	66.8 (64-69.5)	57.5 (55-62)	14.6 (14-15)	6.1 (6-6.5)	16.8 (16-18)	8.9 (8.5-9.5)
3	Northern Arizona	67.5 (67-68)	58.3 (57.5-59)	14.5	6.1 (6-6.2)	16.8 (16.5-17.5)	9.3 (9-9.5)
2	Northern Rockies	66.5 (66-67)	55.5 (55-56)	14.3 (14-14.5)	5.5	17.0	8.5
1	Black Hills	63.0	53.5	14.0	5.2	16.0	9.0

closely than *difficilis*. From the former it is differentiated by its shorter, broader, more convex bill, longer tail, somewhat darker coloration, and paler under wing coverts.

Sonoran specimens reflect the short wing length of the San Pedro Mártir birds. In addition they have somewhat wider bills. This latter variation is in the direction of *E. d. hellmayri*.

In eastern California (Nevada County) and southern Arizona (Cochise, Santa Cruz, and Pima counties) a trend toward *hellmayri* is apparent in increased wing length, broader bill, darker wing bars and breast, and brighter yellow posterior under parts. One specimen from central Arizona (Yavapai County) is about half way between *difficilis* and *hellmayri*. Similar intergrades from Chihuahua have been named *E. d. immodulatus*. The Santa Rita Mountains of Arizona were included within the range of *immodulatus* by Moore, but five breeding specimens from there do not differ from the remaining series from southern Arizona. I believe that birds from all these localities should be considered atypical *difficilis*, since the differences between that race and *hellmayri* are not great enough to allow recognition of an intermediate subspecies. Furthermore, the situation in *hellmayri* in the northern Rockies, to be discussed presently, also lessens the advisability of recognizing an intermediate race to the south.

In northern Arizona (Navajo, Apache, and Greenlee counties) breeding birds agree well with topotypical *hellmayri* from Texas in large general size, broad bill with lateral outlines convex, yellowish olive upper parts, dark olive-buff wing bands, cream-buff edgings of the remiges, whitish or pale yellowish white orbital ring, dark olive-buff breast and sides, and bright yellow posterior under parts.

In the northern Rockies (Colorado, western Wyoming, eastern Idaho, and Montana) agreement with Texas birds is fairly good in color, but there is a slight reduction of wing, tail, and bill size. In the Black Hills of western South Dakota and eastern Wyoming the reduction in size, particularly of the bill, is carried even farther.

In summary I propose the recognition of the following subspecies in the area under consideration.

***Empidonax difficilis difficilis* Baird**

Empidonax difficilis Baird, Rep. Expl. Surv. R. R. Pac., 9, 1858:xxx, 193, 198 (west coast: Fort Steilacoom, Washington Territory; Shoalwater Bay; Fort Tejon, California).

Empidonax bairdi perplexus Nelson, Auk, 17, July, 1900:263 (Puerto Angel, Oaxaca).

Empidonax difficilis immodulatus Moore, Proc. Biol. Soc. Wash., 53, April 19, 1940:24 (Mount Mohinora, Chihuahua).

Range.—Coniferous forests and mesic, broad-leaved woodland areas of Pacific coastal area from southern Alaska to the Sierra San Pedro Mártir, northern Baja California, eastward in the mountains of Sonora and southern and central Arizona, where intergrading with *E. d. hellmayri*. Intergradation also apparently occurs across the Great Basin to the Raft River Mountains in northwestern Utah (Behle, *loc. cit.*).

In winter occurs in southern Baja California (Todos Santos, October 28–November 9) and Oaxaca (Puerto Angel, March 13).

The name *difficilis* occurs at three separate places in the original reference. In the "List of Species," Baird (p. xxx) says of *Empidonax flaviventris* "perhaps replaced on the Pacific by a closely allied species, *E. difficilis*." The species is not characterized at this point, and it is not included in his key to the species of *Empidonax*. To his general introductory account of the genus, Baird (p. 193) appends a table of comparative measurements of the various species. Measurements of *Empidonax difficilis* are included, based on no. 5920, U. S. Nat. Mus., from Fort Steilacoom, Washington. Finally in the discussion of *Empidonax flaviventris* (p. 198) there is a paragraph calling attention to differences between *flaviventris* from the eastern states and birds from the west coast. The paragraph concludes with the statement "In view of all these circumstances, there-

fore, it may be well to give it provisionally a new name, and none would be more appropriate than that of *Empidonax difficilis*." At the end of the discussion of *Empidonax flaviventris* three birds from Pacific localities are included in the list of specimens, although none, at this point, is associated with the name *difficilis*. These three birds are listed in the following order: no. 5920, from Fort Steilacoom, already included in the table of measurements; no. 7243, from Shoalwater Bay [Washington]; and an unnumbered specimen, later catalogued as no. 137201, from Fort Tejon, California.

On the assumption, probably correct, that Baird considered all three specimens to represent his *E. difficilis*, they should all be considered cotypes. Nos. 7243 and 137201 are still in the National Museum, but I could not find no. 5920.

Although all three localities are at present understood to be inhabited by the same race, it is nevertheless desirable to fix the type locality to one of them. The Fort Tejon skin has been given a type label, and it bears the notation "Species was based on 3 skins, of which this is the only adult one." The latter part of this statement is incorrect, however, for the Shoalwater Bay specimen at least is also adult. Fort Tejon was accepted as the type locality in the third (1910) and fourth (1931) editions of the A.O.U. Checklist. Earlier, however, Ridgway (Bull. U. S. Nat. Mus., No. 50, pt. 4, 1907:578) included only Fort Steilacoom and Shoalwater Bay as localities after his citation of the original description. This may be taken as excluding Fort Tejon from later selection.

In restricting the type locality one is almost forced to choose Fort Steilacoom. It is the only definite locality actually coupled by Baird with the name *difficilis*. It is the only specimen included in the table of measurements, where the name was first validated. It is the first of the three western specimens included in the list of specimens examined. I, therefore, formally designate Fort Steilacoom, Washington, as restricted type locality of *Empidonax difficilis*.

The type of *Empidonax bairdi perplexus* Nelson, no. 154569, U. S. Nat. Mus., is a female taken on March 13, 1895, at Puerto Angel, Oaxaca, by Nelson and Goldman. It agrees with fresh-plumaged *E. d. difficilis* and is undoubtedly a migrant of that race. It has the following measurements: wing 63.5, tail 54.5, culmen from base 14.2, width of bill 5, tarsus 15.5, middle toe 8.5 mm. The tenth primary is shorter than the fourth.

***Empidonax difficilis insulicola* Oberholser**

Empidonax insulicola Oberholser, Auk, 14, July, 1897:300 (Santa Rosa Island, California).

Range.—Resident on Santa Rosa, Santa Cruz, Santa Catalina and San Clemente islands off the coast of southern California.

***Empidonax difficilis cineritius* Brewster**

Empidonax cineritius Brewster, Auk, 5, January, 1888:90 (La Laguna, Baja California).

Range.—Resident in the Sierra de la Laguna, southern Baja California.

***Empidonax difficilis hellmayri* Brodtkorb**

Empidonax difficilis hellmayri Brodtkorb, Occas. Papers Mus. Zool. Univ. Mich., No. 306, January 30, 1935:1 (Boot Spring, Chisos Mountains, Brewster County, Texas).

Range.—Breeds in coniferous belt of the Chisos and Guadalupe mountains of western Texas, northeastern Arizona, and thence through the Rocky Mountains to Montana; Black Hills of western South Dakota and eastern Wyoming.

Occurs on migration in Baja California (San Pedro Mártir, May 11; Santiago, November 15), Durango (Chacala, February 27), Jalisco (Zapotlan, April 29), and the Tres Marias Islands (María Madre, May 15; María Magdalena, May 27).

Department of Biology, University of Florida, Gainesville, Florida, April 29, 1948.

THE SEASONAL OCCURRENCE OF ROSY FINCHES AT JUNEAU, ALASKA

By RALPH B. WILLIAMS

From March 22 through April 3, 1948, the writer trapped and banded a total of 306 Rosy Finches (*Leucosticte tephrocotis*) at an elevation of 200 feet above the Gastineau Channel in the residential district of Juneau, Alaska. No specimens were collected for identification, because this is one of the few instances where subspecies can be distinguished in the field. Six of the total were of the race *L. t. tephrocotis*; the remainder were *L. t. littoralis*. Search in the available literature failed to bring to light any data on the occurrence of the subspecies *tephrocotis* in the Alexander Archipelago. There are several records of *littoralis*.

My experience with Rosy Finches dates back to residence in Utah and Wyoming, where I encountered them during the winter in the lowlands and on the prairies. The method used in capturing these birds in Wyoming consisted in exploiting their habit of resorting to the enclosed nests of Cliff Swallows for winter roosting. I plugged the nest openings with non-absorbent cotton at an early hour before dawn. At daybreak, I held a sack net a few inches below the openings and removed the cotton plug. The occupants were captured as they flew out and were banded.

My notes on the birds of southeastern Alaska show that the first Rosy Finches encountered here, all referable to the subspecies *littoralis*, were observed on March 10, 1945. Rosy Finches are not seen about the towns or along the beaches of the numerous, intricate waterways of southeastern Alaska during the fall season. Many of the local birds and species from the north and west move southward during the closing days of August, in what is called locally the "mountain-top migrations."

During the spring migration of 1946, no Rosy Finches were recorded by the author at Juneau. A few thought to be summer residents were seen at various times on the lofty serrate peaks of bare rock, talus slopes and gigantic cliffs of glacial origin east and north of Gastineau Channel during the summer months. Rosy Finches that take up summer residence in southeastern Alaska choose for their breeding habitat the most inaccessible parts of the coastal mountains that lie along the international boundary between southeastern Alaska and adjacent Canada. Among the cracks and crannies of the glaciated cliffs of rugged peaks, just along the line of permanent snow, this subspecies selects its nesting sites.

On April 5, 1947, the first returning migrants, all referable to *littoralis*, were seen feeding in a compact mass of from 50 to 60 individuals on the lawn behind the Governor's mansion at Juneau. They were so tame that one could walk almost into the center of the flock without causing it to take wing. Once disturbed, the flock would settle again, almost immediately, and continue feeding among the dry grasses swept clean of snow by the Taku wind. The next day, from 150 to 200 finches were seen in flight up Gold Creek toward Evergreen Bowl. These birds remained common in the vicinity of Juneau for the greater part of two weeks.

The finches were next encountered on October 19, 1947, at an altitude of approximately 3800 feet, on Mount McGinnis (altitude 4250 feet). My party was well above timberline when it began to snow with blizzard-like fury, and as we topped one of the higher ridges the snowy sky was literally filled with chirping birds. After a few moments the snow ceased, the winds died to breeze velocity, and the birds coming to rest on the windswept tundra plants of this high ridge all proved to be Rosy Finches referable to *littoralis*. They were very tame, scarcely giving way as we continued upward.

The first spring migrants observed by me during the 1948 season consisted of a large flock of over 200 Rosy Finches, seen near the waterfront of Juneau on February 11, 1948. A few flocks of from 25 to 100 individuals were observed daily, especially near the Governor's mansion and on Gold Belt Hill.



Fig. 6. Rosy Finches feeding on seeds near banding area, Juneau, Alaska, April 2, 1948.

During a single storm lasting from March 19 to 21, 32.5 inches of snow fell; this together with the snow already present blanketed the ground to depths of 3 to 4 feet in many places. It is my opinion that the heavy snows resulted in an exceptional concentration of Rosy Finches, Oregon Junco (*Junco oreganus*), Varied Thrushes (*Ixoreus naevius*) with a few Robins (*Turdus migratorius*) and Bohemian Waxwings (*Bombus garrula*).

A Juneau resident fed the birds with canary seed at approximately 7 a.m. daily. When the first birds flew down to feed on seeds broadcast on the snow, others were seen coming from all directions. The concentrations resulting from the mad rush for the seeds resembled swarms of giant bees as the flocks swirled over the snow; an occasional member would fly up here and there, only to settle once again into the mass of moving birds. The flocks collectively totaled well over 1000 individuals.

After such a feeding, the flock would break up into smaller groups and these would scatter to several other feeding stations, where canary seeds were made available at various intervals between the earlier feeding and 9 a.m. Later in the day, a portion of the flock visited the wharfs where longshoremen had also taken to providing food. Other portions spread out over the mountain sides, to gather the Sitka spruce nutlets which had been shaken out and broadcast by the violence of the Taku wind. At the time, spruce trees of this section were heavily burdened with ripe cones. The wind had scattered large quantities of the nutlets over a considerable area shortly after the snow stopped falling, and in my opinion, these would have provided an adequate food supply for the migrants had no feeding stations at all been established by local people.

I took advantage of the concentrations on March 22, and during this first day of banding operations I observed individuals referable to the subspecies *tephrocotis*. Two of these birds were trapped, banded, and released after careful inspection. The final results of the day's banding totaled 107 birds. Of this number 104 were *littoralis*, 2 were *tephrocotis* and 1 was *Junco oreganus oreganus*.

Banding operations were resumed on April 1 and continued through April 3. On April 1, 99 *littoralis*, 1 *tephrocotis* and 2 *Junco oreganus oreganus* were banded. On April 2, 29 *littoralis* and 3 *tephrocotis* were trapped during the morning. The final 68 *littoralis* were trapped and banded on April 3, bringing the total to 309 birds.

During operations it was noted that well over 1000 birds referable to *littoralis* were present, while among this number it was estimated there were from 20 to 25 birds typical of the subspecies *tephrocotis*. The storm of March 19-21 was followed by bright days, with many hours of warm sunshine and freezing nights. This period of sunny days continued through April 14, by which time the concentration had dispersed into smaller flocks. On April 10, 1948, the last small flock of Rosy Finches was seen near Gold Creek.

It may be concluded that the subspecies *littoralis* is the usual Rosy Finch in southeastern Alaska, with stragglers of the subspecies *tephrocotis* ranging into this area from interior Alaska and adjacent Canada.

Juneau, Alaska, July 13, 1948.

FROM FIELD AND STUDY

The Baer Pochard, a Bird New to the North American Fauna.—Over a hundred years ago the United States Exploring Expedition under Capt. Wilkes made an extensive stay along the coasts of Oregon, and even sent a party inland a very considerable distance in western Oregon and northern California. Among the birds collected in Oregon were what were subsequently identified as a pair of Ring-necked Ducks, then called *Fuligula rufoitorques* Bonaparte. The supposed female of this pair is specimen 12773 of the United States National Museum's collection, and it turns out to be, not of this species at all, but an immature, unsexed, example of the Baer Pochard, *Aythya baeri* (Radde). For about a century it has reposed in the study collections at Washington under a false name and in a drawer with specimens of the species to which it had been erroneously relegated. The fact that it was in immature plumage, was not sexed, and had no exact locality or date, and the fact that its diagnostic white under tail coverts were hidden by the stretched webs of its crossed feet, probably led to its being left unstudied by the long line of ornithologists who in the past hundred years have pored over the material in the National Museum. The male of the pair (U.S.N.M. no. 12771) is no longer to be found.

The discovery of this specimen came about when Father Antonio Olivares, a young Colombian priest, who has been assisting me in his spare time as a way of learning American museum techniques and methods, began to assemble all the Ring-necked Ducks for measuring. He noted that it was different from any of the other examples and brought it to my attention. Examination of specimens and literature made it seem evident that it was really *Aythya baeri*. However, the series of this duck immediately available did not include young birds exactly like this one. Thanks to the kindness of Dr. John T. Zimmer, Mr. James L. Peters, and Mr. Boardman Conover, it has been possible to compare our bird with a number of similar, young birds from the collections in New York, Cambridge and Chicago. They are one and the same form.

The identification of no. 12773 is, thus, definitely *Aythya baeri*. The next problem is the locality. All that the label tells us on this point is the one word "Oregon." It is true, of course, that the United States Exploring Expedition went to many parts of the world, but, it so happens, to none in which this duck is known to occur (the species was not even known at the time). The range of the Baer Pochard is in eastern Asia from Transbaikalia and Manchuria to the lower Ussuri and the Amur, and, in winter, from China, Korea, and Japan south to Assam, Burma, and Siam. It follows from this that the possibility of the specimen having been collected on the western side of the Pacific and inadvertently labeled "Oregon" is too slight to be seriously considered, as the expedition did not touch any of these countries. It is unfortunate that the locality "Oregon" is not more definite as the concept of "Oregon Territory" as shown in the atlas of the reports of the expedition indicates that by it was meant what we now know as Oregon, Washington, Vancouver Island, and the southern part of the mainland of British Columbia. It may be pointed out, parenthetically, that neither Gabrielson and Jewett (*Birds of Oregon*, 1940) nor Brooks and Swarth (*Distr. List of Birds of British Columbia*, 1925) make any mention of the work of this expedition. The former pair of authors really missed a good number of "Oregon" records substantiated by specimens still preserved in the United States National Museum.

In corroboration of the correctness of "Oregon" as the locality, we may note that Titian R. Peale, who collected the specimen, stated (U. S. Exploring Expedition, 8, Mammalia and Ornithology, 1848: 253, under "*Fuligula rufoitorques*") that, "We obtained specimens in Oregon, but they did not appear to be common there." The only specimens mentioned are two from Oregon, and no other duck, with which the present specimen might have been confused, is listed from elsewhere than the Oregon area. Cassin's later report on the collection (1858) adds nothing to Peale's earlier statement.

The fact that this early example of the Baer Pochard remained unnoticed for so long is in itself not without its good side, for had it been correctly diagnosed prior to 1863, when Radde (*Reisen Süd. von Ost-Siberien*, 2, 1863:376, pl. 15) described the species from southeastern Siberia, we might well have had an unfortunate type locality in America for a bird that ordinarily occurs only in eastern Asia.

The occurrence of the Baer Pochard in western North America calls to mind the fact that it has also been found to "stray," in the opposite direction, as far as England: Tring Reservoirs (Bull. Brit.

Ornith. Club, 12, 1902:25) and Trent (Brit. Birds, 7, 1914:268). These records are noted by Witherby *et al.* (Handbook British Birds, 3, 1939:296) with the following comment: "These may have been wild birds, but since 'water-fowl' are kept in semicaptivity sometimes without even being properly identified, it seems inadvisable to admit this duck to the list . . ." At the time our specimen was taken, it is safe to say there were no estates with semicaptive waterfowl within even a very great distance of "Oregon."

The specimen is somewhat foxed and the skin apparently was stretched over too large an amount of stuffing originally, causing the brown basal areas of the feathers of the underparts to show more extensively than in any of the others with which it has been compared and giving it a more brownish, less whitish ventral aspect.—HERBERT FRIEDMANN, *United States National Museum, Washington, D.C., July 26, 1948.*

The Dickcissel in California.—The Dickcissel, a species indigenous to the midwestern United States, has not previously been recorded in California. There are, however, records of accidental occurrence in New Mexico, Arizona, and Lower California.

On September 29, 1948, Mrs. Norris Kittinger of Santa Monica, California, inquired by telephone about the identity of a strange bird which had come to her feeding station. I was unable to identify the bird from her preliminary description and called her again the following day. At this time she informed me that not only was the bird still there but that she had succeeded in capturing it alive. According to her, the bird first made its appearance at 5 p.m. on September 29, 1948. It was observed sitting near the feed box and did not appear to be wary, but it refused to enter the box until all the other birds had left. It preened itself for a while and then entered and fed.

On September 30, 1948, at Mrs. Kittinger's request, I went to Santa Monica and closely examined the captive. It proved to be an adult male Dickcissel (*Spiza americana*) in beautiful, fresh-fall plumage. Its legs were fresh and clean in appearance and gave no sign of having been confined in an aviary. The bird was extremely wild and refused to sit still upon the perch for even a second, another characteristic which would seem to indicate that it had not previously been confined in a cage. The freshly molted plumage was typical of the male of the species except that the black throat patch, instead of being very pronounced, consisted of a scattering of black-tipped feathers. The supraocular stripe was very yellow. During the course of my half-hour study of the bird, it hopped continuously from one perch to another, uttering a solitary, sharp chirping note every few seconds.

On October 9, 1948, Mrs. Kittinger informed me that she had changed her mind about keeping the bird and had liberated it, thus closing the story of the first Dickcissel for California.—KENNETH E. STAGER, *Los Angeles Museum, Los Angeles, California, October 14, 1948.*

Eye-color of the Green Jay in Mexico.—Three Green Jays (*Xanthoeca yncas*) which we collected in Mexico in 1947 throw further light on the distribution of the yellow-eyed and brown-eyed forms discussed by Sutton (Condor, 49, 1947:196-198). A male which Edwards took approximately four miles northwest of Potrero, which is near Córdoba, Veracruz, had bright yellow irides. This substantiates Sutton's belief that Fuertes may have had experience with yellow-eyed Green Jays in the vicinity of Córdoba. In plumage coloration our Potrero specimen is intermediate between *X. y. luxuosa* and *vivida*. Also yellow-eyed was a male which Edwards collected in Chiapas near the Hacienda Monserrate, about forty miles north of Arriaga. It appears to be *vivida* in the decidedly yellowish tinge of the belly and reduced amount of green in the under tail coverts.

Lea secured a brown-eyed male along the Rio Sabinas near Gómez Farías, Tamaulipas. It is the least yellowish of our three specimens, appearing to be typical *luxuosa*. Individuals which we were able to observe closely in the field at this locality were all dark-brown eyed.—ROBERT B. LEA, *Northwestern University Medical School, Chicago, Illinois*, and ERNEST P. EDWARDS, *Laboratory of Ornithology, Cornell University, Ithaca, New York, July 24, 1948.*

The Oven-bird and the American Redstart in Imperial Valley, California.—A female Oven-bird (*Seiurus aurocapillus*) was collected by us on October 3, 1948, near the southern end of Salton Sea, Imperial County, California. The bird was first observed in a tamarisk tree. The specimen is now no. 676 in the Cardiff Collection and is the third thus far taken in southern California.

An immature female American Redstart (*Setophaga ruticilla*) was collected at the same place, also, on October 3, 1948. The bird was first observed flying from a flax field into a tamarisk tree. This is the first record for the American Redstart in Imperial Valley. The specimen is no. 677 in our collection.—EUGENE E. CARDIFF and BRUCE E. CARDIFF, *Bloomington, California, October 20, 1948.*

An Unusual Mourning Dove Nest.—On June 2, 1948, I found a nest of the Mourning Dove (*Zenaidura macroura*) at Pine Hill Cemetery, Scott County, Iowa, which consisted of a remodelled Bronzed Grackle (*Quiscalus quiscula*) nest. The grackles had raised their young and left several weeks before. Their nest had been partly upset by the wind and the dove had added a few sticks to the side of the overturned structure and molded a cup with its breast. The nest was five feet from the ground in a fir tree and it contained four eggs in what I thought to be about the same stage of incubation. On June 23, 1948, I again visited the nest and found it contained two nestlings about ready to leave the nest plus two eggs in an advanced stage of incubation. This seems to indicate that two females had used the nest instead of one. On the ground directly below the nest I found a well incubated egg which evidently had been on the ground for some time, as it was stained by the grass. I can not account for this fifth egg, as it was not in the nest on June 2, unless it had been deposited after my first visit and was incubated with the others. When the first two eggs hatched and the nestlings grew and became active in the nest, the egg must have been shoved out of the already over-crowded nest. The egg that was found on the ground must have been laid by a third female as it was abnormal in shape, tapering down to a distinct point on one end.—JAMES HODGES, *Davenport, Iowa, July 5, 1948.*

The Saw-whet Owl in Los Angeles County, California.—On the morning of April 4, 1948, a Saw-whet Owl (*Aegolius acadicus acadicus*) was found dead on the Angeles Forest Highway 1½ miles southwest of the Big Tujunga Canyon Narrows, at an elevation of about 3000 feet, Los Angeles County, California, by Jack H. Van Nordheim and the writer. The bird had evidently been feeding on a deer mouse (*Peromyscus maniculatus*) as remains of this mammal as well as those of the bird were smashed on the road. The San Gabriel Mountains in this vicinity are cut with deep rocky gorges; the mountain summits are scattered with pines, and the slopes are covered with chaparral. The Saw-whet Owl has been recorded from various scattered localities in southern California, but to my knowledge it has not previously been noted in Los Angeles County. The skin is now no. 1846 in the collection of the Allan Hancock Foundation, University of Southern California.—JACK C. COUFFER, *University of Southern California, Los Angeles, California, August 30, 1948.*

NOTES AND NEWS

This year's annual meeting of the Cooper Ornithological Club will be held at Los Angeles on April 8-10.

The name of the recently elected treasurer and business manager of the American Ornithologists' Union, incorrectly reported in the last issue of the Condor, is R. Allyn Moser.

PUBLICATIONS REVIEWED

ISLAND LIFE: A STUDY OF THE LAND VERTEBRATES OF THE ISLANDS OF EASTERN LAKE MICHIGAN. By R. T. Hatt, J. Van Tyne, L. C. Stuart, C. H. Pope, and A. B. Grobman. Cranbrook Institute of Science Bulletin No. 27: xii+179 pp., frontispiece and 43 figures. Cloth binding. \$4.00.

This is an attractive volume, as fine a job of book-making as it is a report of field work completed. The text deals with animal geography, specifically the mammals, birds, reptiles, and amphibians of the islands in Lake Michigan lying off the northwest shores of the Lower Peninsula of Michigan. The islands total eighteen and vary in size from Beaver Island, which is 58 square miles in extent and supports hardwood forest, to Pismire Island, a gravel bar of two acres. Geological and cultural histories of the region are also considered. The book is a product of joint efforts in the field of the Cranbrook Institute of Science and the University of Michigan in the years 1937 to 1944, and it should be of interest to students of insular faunas anywhere.

The section of the book dealing with birds, pages 69 to 114, was written by Van Tyne. The bulk of these pages is occupied by a carefully prepared annotated list summarizing all distributional records. Of the 152 species recorded on the islands, 52 breed on Beaver Island and on at least one to six of the others. Fifteen additional species are known to breed on Beaver Island only. Van Tyne points out that the avifauna of these islands is poorer in species than that of the adjacent mainland, yet absences of particular species cannot always be explained by lack of suitable habitat. Thus, Redstarts and Oven-birds occur in forest where Least Flycatchers and Wood Pewees would also be expected, but the latter species are not found. Sixteen species which breed on the mainland are absent on the islands except in migration when only five of them occur. Five additional species which are present as migrants on the mainland were not found on the islands. Only

two species display any geographic variation: The Eastern House Wren occurs on the more southern islands, the Western House Wren on the more northern ones. Some distinctions, not recognized nomenclaturally, are also made between mainland and island populations of the Red-wing.

Following the distributional sections, there is a brief chapter on modification of habits shown by island populations of several species. The terminal chapter on factors of distribution reviews the evidence for time, mode, extent, and sources of island invasions and the problem of depauperate faunas. It is shown, for example, that island animals frequently occupy cover types which they do not use on the mainland. Although faunal composition varies with ecological diversity of terrain and plant cover rather than with absolute area, the species:communities index fluctuates in a table correlating numbers of plant communities with numbers of animal species, indicating that, at least for the four vertebrate classes considered, the composition of these insular faunas is to a certain degree hit-and-miss. No ideas or concepts new to animal geography emerge in this study, but it does serve to put on a more sound basis several concepts perhaps too freely thrown about in discussions of insular faunas, and it is obviously an important contribution to the biological record of the region of northern Lake Michigan.

The volume closes with an appendix listing vertebrates found on each island, a bibliography of 75 titles, and an eight-page index. The text is well organized, accurate, and clear; its style is admirably modest. The illustrations are excellent. —FRANK A. PITELKA.

THE BIRDS OF TROPICAL WEST AFRICA. Volume 6.

By David Armitage Bannerman. The Crown Agents for the Colonies, London, xxxix + 364 pp., August, 1948.

Resumption of the publishing of this important series of books, after an interval of eight years since volume 5, should be especially noted. For a review of the first volume which describes the work and indicates its excellent qualities, see Grinnell, Condor, 33, 1931:132-134. Volume 6 covers the Paridae, Corvidae, Sturnidae, Zosteropidae, Nectariniidae, Certhiidae and Fringillidae. Two more volumes are contemplated. —ALDEN H. MILLER.

COOPER CLUB MEETINGS

SOUTHERN DIVISION

SEPTEMBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held September 29, 1948, in Room 145 Allan Hancock Hall, University of Southern California. The following were proposed for membership: Mrs. Zerifa S. Kroll, 608 W. Locust St., Lodi 3, Calif., by Dr. John Arnold; Cornelius G. Willis, 417 S. Hill St., Los Angeles 13, Calif., by Don Bleitz; Bernard Devaney, 466 W. Vine St., Lancaster, Pa., by G. E. Grube; William R. Lasky, 618 S. Coronado St., Los Angeles 5, by Mary V. Hood; Earle R. Greene, 9470 Santa Monica Blvd., 404 Bank of America Bldg., Beverly Hills, Calif.; Mrs. James N. Hawks, 80 E. Grandview Ave., Sierra Madre, Calif.; Gordon C. Odum, Triple Island Lightstation, Dept. of Transport, Box 999, Prince Rupert, B.C., Canada; Fred John Pierce, Winthrop, Iowa; Mrs. Wm. Stribling, 316 W. Micheltorena St., Apt. E, Santa Barbara, Calif.; and William H. Stribling, Jr., 316 W. Micheltorena St., Apt. E, Santa Barbara, Calif., by W. Lee Chambers; Mrs. Amos P. Balsom, 2209 E. Stratford St., Milwaukee 11, Wisconsin; Remsen Brinckerhoff, 156 Sherwood Pl., Englewood, New Jersey; Dr. John L. Boling, Linfield College, McMinnville, Oregon; Mrs. Signa L. Brolin, 829 E. Claremont St., Pasadena 6, Calif.; Mrs. James Robert Cain, 108 Park Ave. East, Savannah, Georgia; William Sloan Clarke, Jr., Box 167, State College, Pa.; Clifford V. Davis, Montana State College, Bozeman, Montana; Reginald Denham, 100 Central Park South, New York 19, N.Y.; E. Ford Dicks, 1147 S. 34th St., Tacoma, Wash.; Dora Whitman Fluekiger, Hotel Dauphin, Broadway and 67th St., New York 23, N.Y.; Stanley S. Gairlock, Kingston, Rhode Island; Mrs. Elizabeth Burwell Goolden, 5611 Carlton Way, Los Angeles 28, Calif.; Richard Edes Harrison, 22 W. 48th St., New York 19, N.Y.; Naomi Wilma Hiatt, 338 N. Comstock Ave., Whittier, Calif.; Philip Strong Humphrey, Apt. 84, G.I. Village, Amherst College, Amherst, Mass.; Frances F. Jahn (Mrs. Theodore L. Jahn), 10241 Chrysanthemum Lane, Los Angeles 24, Calif.; Robert Graham Jeffrey, Box 517-A, Rt. 1, Stanwood, Wash.; Samuel Booker McDowell, Jr., Dept. of Zoology, Columbia University, New York 27, N.Y.; David John McNett, Yelm, Wash.; Ethel M. Murden, P.O. Box 85, Geneva, N.Y.; Noland F. Nelson, Ogden Bay Refuge, Hooper, Utah; (Helen) Ann Reynolds, 826 W. Whitley St., Whittier, Calif.; Mrs. Mildred Baker

Rosa, 41 Custer St., Buffalo 14, N.Y.; E. J. Sawyer, 2700 Maplewood Ave., Bellingham, Wash.; R. Manville Touring, % International Petroleum Co., Talara, Peru; Dr. Harold F. Tufts, Port Mouton, Queen's Co., Nova Scotia; Jack F. Wayrick, Pines Lake, R. D. 1, Paterson, N.J.; Gustave J. Yaki, Sandwith, Sask., Canada; Arthur E. Aronoff, 59 W. 71st St., New York, N.Y.; Austin A. Innes, 1218 Myra Ave., Los Angeles 27, Calif.; Francis J. O'Connor, 14638½ Dickens St., Sherman Oaks, Calif.; and Mrs. Whiting Washington, North Edgcomb, Maine, all by C. V. Duff.

A resolution was unanimously adopted expressing regret in the death of Harold E. Gay, member of the Club since 1901.

Ed N. Harrison and Frances F. Roberts presented a Kodachrome motion picture, "A Sonoran Journey."—DOROTHY E. GRONER, *Secretary*.

OCTOBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held October 26, 1948, in room 145 Allan Hancock Hall, University of Southern California. The following names were proposed for membership: George E. Gerald, 141 Farnham Ave., Toronto, Ontario, Canada, by Anne Merrill; Susan Emily Beaman, R. R. 2, Sidney, Ohio, Martin Ralph Brittan, Natural History Museum, Stanford University, Stanford, Calif., Albert Lewis Campbell, 345 W. 72nd St., Chicago 21, Ill., George Goetz Daniels, 74 Phillips St., Boston, Mass., William R. Hanson, State Game and Fish Dept., Bismarck, No. Dakota, Robert D. Mallette, 652 Highland Court, Upland, Calif., Mrs. Lucie McDougall, R. R. 1, Port Credit, Ontario, Canada, Randolph Moser, 1773 El Molino, Pasadena 6, Calif., Miguel Alvarez del Toro, Apartado Postal No. 6, Tuxtla Gutierrez, Chiapas, Mexico, Samuel Robert Savage, Box 263, Overton, Texas, and Benjamin Martin Shaub, 159 Elm St., Northampton, Mass., all by C. V. Duff.

Miss Annie M. Alexander was unanimously elected to Honorary Membership.

Dr. H. Elliot McClure, of the Hooper Foundation, spoke on "Some Birds and Bird Problems in the Southern San Joaquin Valley."—DOROTHY E. GRONER, *Secretary*.

NORTHERN DIVISION

OCTOBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, October 28, 1948, in Room 2503 Life Sciences Building, University of California, Berkeley. Proposals for membership

were read as follows: Kenneth L. Diem, 2421 Prospect St., Berkeley 4, Calif., and Abe S. Margolin, Dept. of Biology, Phoenix College, Phoenix, Ariz., by F. A. Pitelka; R. E. Paulson, Dept. of Zool., University of Calif., Berkeley, Calif., by R. R. Ronkin; Ralph B. McCormick, 1545 S. 54th St., Apt. 1-B, Richmond, Calif., and Robert Rumsey Rapp, 34 Main St., Ridgefield, Conn., by R. W. Storer; and David H. Woodside, Box 2524 Stadium Commons, Pullman, Wash., by Frank Richardson.

Dr. Alden H. Miller spoke on "Birds of the Sierra Madre of Chihuahua."—LOIS C. TAYLOR, *Acting Secretary*.

NOVEMBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, November 18, 1948, in Room 2503 Life Sciences Building, University of California, Berkeley. Proposals for membership were read as follows: Garth Ellis Cummings, 860 Begien Ave., San Leandro, Calif., proposed by Seth T. Bailey; Matilda M. Brooks [Mrs. Sumner C.], 630 Woodmont Ave., Berkeley, Calif., by Hilda W. Grinnell; C. Donald Neill, 753 S. 43rd St., Apt. 1-R, Richmond, Calif., and Daniel J. Miller, 941 Page Street, Berkeley, Calif., both by Richard R. Johnston; Wallace M. Good, 112 Snow Hall, Univ. of Kansas, Lawrence, Kansas, and James W. Bee, Museum of Natural History, University of Kansas, Lawrence, Kansas, both by Charles G. Sibley. Miss Annie M. Alexander was elected to honorary membership.

Mr. Howard L. Cogswell gave an interesting talk on "Impressions of the Summer Bird-life in the Donner Pass Region."—LOIS C. TAYLOR, *Acting Secretary*.

DECEMBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, December 16, 1948, in Room 2503 Life Sciences Building, University of California, Berkeley. Proposals for membership were read as follows: Mervin W. Larson, 2440 River Drive, Stockton, Calif., proposed by Verna R. Johnston; R. P. Parsons, 861 Sutter Street, San Francisco, Calif., and David Ware Johnston, Dept. of Zoology, Univ. of Georgia, Athens, Georgia, both by F. A. Pitelka; and Miss Neva M. Brodrick, 721 Cleveland Ave., Oakland 6, Calif., by Mrs. Junea W. Kelly.

A talk entitled "Observations on the Breeding Behavior of the Ring-necked Pheasant" was given by Mr. Richard D. Taber.

The problem of changing the meeting time from the last to the first Thursday of each month, first raised at the October meeting, was discussed. Mr. Childs moved that the meeting time be changed to the first Thursday in each month beginning September, 1949. Motion seconded and carried. Dr. Miller moved that a nominating committee be appointed by the president and delegated to prepare a slate of officers for 1949. Motion seconded and carried.—LOIS C. TAYLOR, *Acting Secretary*.

For Sale, Exchange and Want Column—Each Cooper Club member is entitled to one advertising notice in any issue of *The Condor* free. Notices of over five lines will be charged for at the rate of 25 cents per line. For this department, address SIDNEY B. PEYTON, R. R. No. 2, Box 260, Fillmore, California.

WANTED—"The Nesting Habits of the Hermit Thrush," by Dayton Stoner, Univ. of Iowa Studies in Nat. Hist., Vol. 9.—HERVEY BRACKBILL, 4608 Springdale Ave., Baltimore 7, Md.

WANTED—Griscom's Monograph of the Crossbills and a run of *The Ibis*, 1935 to date.—ALFRED M. BAILEY, Colorado Museum of Natural History, Denver, Colorado.

WANTED—Position as artist with a museum, scientific organization or magazine. Detail work in ink, watercolor and tempera. Knowledge and experience of map drafting, lettering and layout. Can furnish samples on request. Will accept free-lance work.—MR. FRANCIS O'CONNOR, 14638½ Dickens St., Sherman Oaks, Calif.

FOR SALE—The following copies of Bent's Life Histories. Bulletins nos. 142 and 146 (Shore Birds) in fine second-hand condition, the two for \$8.00; no. 174, Woodpeckers, new, \$5.00; no. 170, Birds of Prey, part 2, \$7.50; no. 113, Gulls and Terns, as new, \$20.00; no. 146, Shore Birds, part 2, new, autographed, \$7.50.—FRANK N. BASSETT, 722 No. Orange Drive, Los Angeles 38, Calif.

WANTED—Goshawk or Cooper Hawk. Full grown female if possible, for study. Alive and in good condition. Write JEROME BEGUN, 858 44th Ave., San Francisco 21, Calif.

FOR SALE—We have accumulated another lot of back issues of *The Condor*, running from volume 14 (1912) to date. These are in good second-hand condition and we will sell them for just ½ the regular prices. Don't wait too long before placing your order, for sales have always cleaned up bargain stock.—COOPER ORNITHOLOGICAL CLUB, Topanga, California.

FOR SALE—A file of *The Auk*, from vol. 13 (1896) through vol. 63 (1946), 51 volumes in all, in fine condition, in parts as issued; many of these volumes are out of print and rare; price \$125.00. Also, many odd volumes from vol. 4 up, and many odd numbers as far back as vol. 9; will sell odds at a discount of 50% from regular A.O.U. prices.—W. LEE CHAMBERS, Topanga, California.

AVAILABLE—Copies of several papers in the series "Studies of Waterfowl in British Columbia," and "Observations of Birds and Mammals in Central British Columbia" are available for distribution. Requests should be addressed to J. A. MUNRO, Okanagan Landing, B. C.

WANTED—*Auk*, vol. 1, nos. 1, 2, and 3; vol. 2, nos. 2, 3, and 4; vol. 3, no. 4; vol. 4, no. 1; vol. 5, nos. 1 and 4; and vol. 6, nos. 1 and 3. Also Bulletin of the Nuttall Ornithological Club, vol. 1, July and October, and vol. 2, July and October. Will pay good price for wanted issues or entire volumes.—IRA N. GABRIELSON, Wildlife Management Institute, Investment Bldg., Washington 5, D. C.

FOR SALE OR TRADE—Brewster's Birds of the Cape Region of Lower California; Riley's Birds from Siam and the Malay Peninsula; Deignan's Birds of Northern Thailand; Chapman's Upper Zonal Bird-life of Mts. Roraima and Duida; Friedmann's Birds Collected by the Nat. Geog. Soc. Expeditions to No. Brazil and Venezuela; Bent's Life Histories N. A. Flycatchers, Larks, Swallows and their Allies. Wish to locate following: Heilmann's Origin of Birds; Bird-Banding I(4), II(1, 4), III(1, 4), IV(1, 4), VI(1), IX(1), XIII(3); separates of Zool. Record, section Aves.—J. J. HICKEY, 424 University Farm Place, Madison 5, Wisconsin.

WANTED—The following gov't publications by W. W. Cooke: Migratory Movements of Birds in Relation to the Weather (Year-book Dept. of Agri. separate, 1910); Distribution of the American Egrets (Bur. of Biol. Surv. Circular No. 84, 1911); Preliminary Census of Birds of the United States (Bull. U. S. Dept. Agri. No. 187, 1915).—FRED J. PIERCE, Winthrop, Iowa.

FOR SALE—Complete set of *The Auk*, 1884 to 1946, and the Bull. Nuttall Orn. Club, 1876-1883; through 1919, yearly volumes bound in red linen with black leather backs and corners; 1920 through 1936 unbound, but each year in black case; 1937 to April, 1946 unbound; ten-year indices to the *Auk* in bound volumes; price for complete set, \$275.00 plus freight charges. Also, separate unbound volumes of *The Auk* for 1914-1918, 1940 and 1941; make offer for the lot. Also, Dawson's Birds of California; deluxe large paper edition, 4 vols., \$25.00 plus freight charges.—V. ROTH, 609 Arballo Drive, San Francisco 12, California.

PREPARATION OF MANUSCRIPTS FOR THE CONDOR

Articles published in the Condor normally are written by members of the Cooper Ornithological Club. Practically all the Club's money goes into the magazine; no editor and no business manager receive any pay other than the satisfaction of doing a service worthily. The preparation of good copy by the author will contribute greatly to accuracy of published output, dispatch in handling, and economy of production.

To be acceptable for inclusion in the Condor, articles must not duplicate in any substantial way material that is published elsewhere. Any type of subject bearing on birds may be considered; but the geographic areas of primary concern are western North America, Central America, and the Pacific Basin. Manuscripts may be submitted to any one of the editors (see inside front cover for address). Proofs with edited manuscripts will be sent to authors, at which time reprints may be ordered.

In the interests of accuracy and economy, observe the following: do not duplicate data in text, tables, or charts; check citations to original sources and verify text references; quoted statements must be exact replicas of the original; preferably use vernacular names applicable to the entire avian species (for a guide in this regard, see "The Distribution of the Birds of California," *Pac. Coast Avif.* No. 27, 1944:5-34); in general, avoid subspecific vernaculars; insert scientific names for species but not the subspecific name except in taxonomic papers or where the race concerned has been critically determined by the author or his collaborators; revise the manuscript repeatedly to remove superfluous words and phrases, immaterial detail, and repetitious statements.

Note Condor style and usage. "General Articles" and the "Field and Study" items are set up in different form. Provide a concise, meaningful title, and, where needed, subtitles within the text. Footnotes are not used. The address line may serve to indicate institutional connection, and to it should be added the date of transmittal of the manuscript. Terminal bibliographies are desirable where five or more titles are to be cited; otherwise, the references may be included in the text. For bibliographic style, note closely the practices employed in recent volumes of the journal. A factual summary is recommended for longer papers.

Rules for copy.—(1) typewrite material, using one side of paper only; (2) double space *all* material and leave liberal margins; (3) use $8\frac{1}{2} \times 11$ inch paper of standard weight (avoid onion skin); (4) carbon copies are not acceptable; (5) place tables on separate pages; (6) number pages in upper right hand corner.

Illustrations.—Photographs should be glossy prints of good contrast. Make line drawings with India ink; plan linework and lettering for at least $\frac{1}{2}$ reduction; do not use typewritten labels on the face of the drawing. Provide typed legends on separate sheets.

Helpful references on writing: *Manual of Style*, University of Chicago Press, and *Rules of the Editorial Committee*, University of California Press. On scientific nomenclature: A.O.U. Checklist (with supplements 19 through 23) and *Pacific Coast Avifauna* No. 27; authors are not required to follow either of these works.

THE EDITORS OF THE CONDOR.

